TEACHING SHOP WORK

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HAYNES

Donald L. Ritchie

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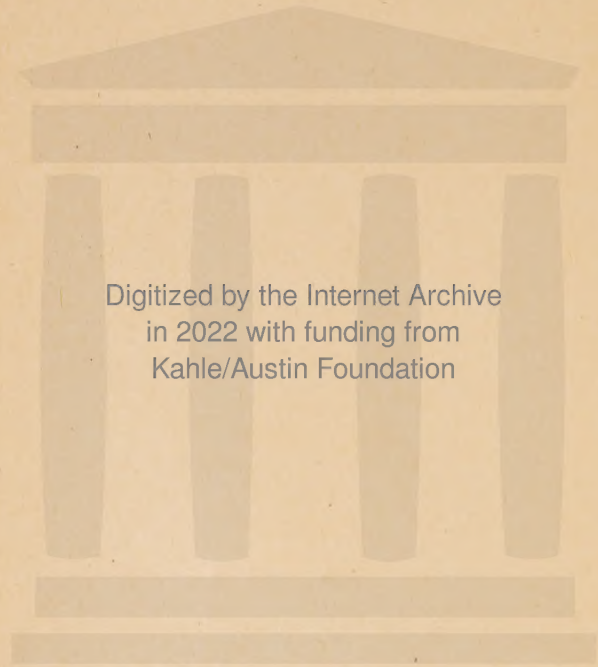
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TEACHING SHOP WORK

A HANDBOOK FOR INSTRUCTORS IN VOCATIONAL SCHOOLS AND FOR STUDENTS IN TRADE-TEACHER TRAINING CLASSES

BY

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PREFACE

The recent movement for vocational education has presented a demand for teachers to carry on the work. Men qualified to teach trade work cannot be found in sufficient nor even in any appreciable number. The manual-training movement drew in a few mechanics, particularly from wood-working trades, and gave them some practice in teaching shop work from the manual-training or industrial-arts standpoint. A few normal schools have provided courses of training for manual-training teachers, including both the principles of pedagogy and the skill in tool work, but the objective of these courses has been a manual-arts objective, not the trade-skill objective. A few men with previous trade experience were taken over from the manual-training field into the vocational field; but inasmuch as the standards early set up for vocational trade work required a mastery of the trade as a prime qualification for the trade-teacher, the natural source of supply for such teachers was the trade itself; and, accordingly, many vocational schools have recruited the greater part of their teaching-staff directly from the trade.

It has been keenly realized, however, that mere mastery of the trade is not the only requisite for a successful teacher of trade work. Teaching itself is a trade, no matter what the subject matter being taught. Men brought in from industry to become teachers were thus asked to learn a new trade. There was but little opportunity for them to learn it by the method through which most of them had mastered their previous trades; namely, the apprenticeship method,

for the masters of the new trade of teaching industrial work were not available in sufficient numbers to direct the new learners. Consequently the greater number of teachers now in vocational work have acquired their teaching-trade by the older and less efficient method of "picking up" the trade. This is only a passing phase of the movement, however, and serious efforts have been made during the last few years to develop systems of training for making tradesmen into teachers.

The agencies that have given the greatest stimulus to the training of trade-teachers have been, first, the National Society for Vocational Education, which has discussed the matter in its conventions and published these discussions in its bulletins; second, the Federal Board for Vocational Education, which has not only required the various states to engage in teacher-training but has also provided funds for carrying on the work and has published considerable literature in pamphlet form relative to the problem. Federal Board Bulletins Nos. 60, 61, and 62 deal with the closely related problem of foreman-training as well as teacher-training. It must also be recognized that the development of the work to the stage described in these bulletins is an outgrowth of the system of trade-teacher training set up in Massachusetts several years ago. One of the pioneers in the Massachusetts work was Mr. Charles R. Allen, who later developed the teacher-training work of the Emergency Fleet Corporation during the war, out of which came his book "The Instructor, the Man, and the Job," which is the most valuable contribution yet available on this subject.

The types of instructor-training courses that have been attempted in various places are described in *Bulletin No. 62* under the following classifications:

1. The short-unit continuous intensive course.
2. The short-unit discontinuous intensive course.
3. Modifications of the short-unit discontinuous intensive course.
4. The long-term continuous training course.

It is with the second of these types, the short-unit discontinuous intensive course, that the author has had experience, and this volume is the outgrowth of his notes while conducting evening classes for trade-teachers under the auspices of the New Jersey State Department of Public Instruction. This material is now published for the benefit of all workers in the field of vocational education, and particularly for teachers-in-training, because the existing material of this kind is so meager. It is our hope that these ideas and suggestions, which have been collected and organized with much toil, may facilitate the work of other directors of teacher-training classes and render some contribution to the much-needed literature on this subject. It is believed that the suggestions herein offered will prove valuable in any type of trade-teachers' training-class and will also be of service to many vocational teachers throughout the country who have been drawn into the work without the advantage of a training-course.

Acknowledgment is made of the most cordial coöperation of Mr. Wesley A. O'Leary, Assistant Commissioner of Education in charge of vocational education in the state of New Jersey, and of Mr. J. Gould Spofford, State Supervisor of Industrial Teacher Training for New Jersey, both in conducting the work out of which these notes have developed, and in granting generous permission to use herein much material issued officially by the New Jersey State Department of Public Instruction. The presentation of this material in the form of units represents the author's ideal of what a

training-course might be, not necessarily what it actually has been. It is not intended to give the impression that all that is herein stated is officially indorsed by the New Jersey State Department.

The author is also indebted to the following persons for specific favors in connection with the preparation of the manuscript: to Professor D. J. MacDonald, of Ohio State University, for material out of which was developed the section on Observation of Teaching; to Mr. A. W. Garritt, Supervisor of Shop Work in the New York City Schools, for permission to publish the Teachers' Self-Estimate Chart; to Miss Clara Louise Dentler, of the Polytechnic High School, San Bernardino, California, and to the editor of the *Journal of the National Education Association*, for permission to reprint the poem "Why Should I Teach?" to Mr. Layton S. Hawkins, Director of Education of the United Typothetæ of America, Chicago, for permission to use much material from Typothetæ publications; to Professor O. H. Day, of Indiana University, for reading the manuscript and offering many helpful suggestions.

Finally, the encouragement of Dr. Arthur D. Dean, Professor of Vocational Education in Teachers College, Columbia University, under whose persuasion this material has been organized and published, is most gratefully recognized.

MERRITT WAY HAYNES

CONTENTS

PAGE

INTRODUCTION ix

UNIT ONE. PRINCIPLES OF VOCATIONAL EDUCATION 1

Teaching a Distinct Trade. Definition of Vocational Education. Kinds of Vocational Education. History of Vocational Education: The Manual-Training Movement. The Industrial-Education Movement. Rapid Growth of Interest in Industrial Education. Types of Public Industrial Schools. Private Industrial and Trade Schools. Practical Difficulties in introducing Industrial Education. Movements allied to Industrial Education. Summary of Arguments for Public Vocational Education. Definitions.

UNIT TWO. OBSERVATION OF TEACHING 10

Visiting Schools. Observation Reports.

UNIT THREE. TRADE ANALYSIS 25

The Importance of Trade Analysis. Type Jobs in a Trade. Classification of Type Jobs: Trade Blocks. Arranging Type Jobs in the Order of their Difficulty: Progression Factors. Analyzing a Job into its Contents. Production Content. Knowledge of Stock. Trade Terms and Safety Precautions. Trade Calculations. Trade Science. Trade Drawing. Trade Judgment. The Trade-Analysis Chart.

UNIT FOUR. PRINCIPLES OF TEACHING 42

The Teaching-Process. Instruction Devices. The Teaching-Unit —The Lesson. Teaching a Lesson in Shop Work. Lesson-Planning and Trial Teaching. Class Management. Ethics of the Teaching-Profession.

UNIT FIVE. PRACTICE-TEACHING 135

Practical Difficulties. Needs and Recommendations.

UNIT SIX. SCHOOL-SHOP ORGANIZATION AND MANAGEMENT 138

Organizing the School Shop. Operating the School Shop.

UNIT SEVEN. PSYCHOLOGY APPLIED TO STUDENT ANALYSIS 155

The Value of Psychology to the Shop-Teacher. Native Capacity of Students. Sense Perception applied to Shop Work. Trade Habits and Trade Judgment. Human Motives and Interest. Rating Students in Shop Work. Shop Discipline.

INDEX 235

INTRODUCTION

In formulating a pedagogy of trade-teaching the chief solvent of the problem thus far has been the principle of analysis. Much stress has been given to the importance of analyzing into its basic divisions the trade to be taught; then analyzing each division, continuing the process until not only the lesson but its division into teaching-points has been distinctly recognized and properly listed. According to this principle the problem of trade-teaching appears as a fivefold phase of analysis:

1. Analysis of the trade to determine what to teach.
2. Analysis of the students to understand whom we are teaching.
3. Analysis of teaching-methods to know how to teach.
4. Analysis of teaching-facilities to determine with what to teach.
5. Analysis of social and industrial conditions in the community to determine the functioning of teaching.

Applying the analysis operation to each of these phases gives several distinct units, which, for convenience, may be arranged as follows:

Unit One. Principles of Vocational Education.

Unit Two. Observation of Teaching.

Unit Three. Trade Analysis.

Unit Four. Principles of Teaching, including Lesson Plans and Trial Teaching.

Unit Five. Practice-Teaching.

Unit Six. Shop Organization and Management.
Unit Seven. Psychology Applied to Student Analysis.
Unit Eight. Sketching for Shop-Teachers.
Unit Nine. Mathematics for Shop-Teachers.
Unit Ten. Science for Shop-Teachers.
Unit Eleven. English for Shop-Teachers.
Unit Twelve. Community Surveys.

Only the first seven of these topics will be considered in this volume.

TEACHING SHOP WORK

UNIT ONE

PRINCIPLES OF VOCATIONAL EDUCATION

This unit is presented in syllabus form. The synoptic outline is believed more valuable here than complete text. The matter suggested can easily be studied in the references cited. It would become too voluminous if completely written out. Moreover, the study of it would require more time than is necessary to devote to the topic at the beginning of the course. A broad sweep of the subject in one or two sessions has been found to be a good foundation for a class. Toward the close of a three years' course the topic may be taken up for more complete study.

INTRODUCTION. **Teaching is a Distinct Trade.** Whatever trade the teacher-in-training already knows, he is now to learn a new trade, that of teaching.

Methods of learning trades.

1. *Pick-up method:* unorganized, haphazard; production the sole aim, instruction an unconscious by-product.
2. *Apprenticeship:* working with a master workman, production chief aim, instruction secondary.
3. *School:* instruction primary aim; principles and practice organized in a logical manner to be learned with greatest economy of time and effort; production secondary — a means, not the end.

The modern method of teaching trades by organized instruction is a phase of vocational education.

1. **Definition of Vocational Education.** "Vocational Education is that education which fits for profitable employment."

2. **Kinds of Vocational Education.**
   - *a.* Professional: law, medicine, theology, teaching, engineering.
   - *b.* Commercial: bookkeeping, stenography, clerical, salesmanship.
   - *c.* Industrial: mechanical or constructive trades for both men and women.
   - *d.* Agricultural.
   - *e.* Domestic: cooking, sewing, home-making.

3. **History of Vocational Education: the Manual-Training Movement.**
   - *a. Technical Colleges:* Massachusetts Institute of Technology, 1877.
     - (1) Argument: need of shop instruction for engineering students.
     - (2) Method: sets of models based upon tool sequence.
   - *b. High Schools:* St. Louis, 1879; Indianapolis; Chicago; Boston; Oakland, California.
     - (1) Arguments:
       - (*a*) Book education alone not sufficient for an industrial people. "Send the whole boy to school."
       - (*b*) Attractiveness of handwork would hold pupils in school longer.
     - (2) Methods: similar to technical colleges.
     - (3) Results:
       - (*a*) Became preparatory schools for technical colleges.
       - (*b*) Became dominated by arts and crafts movement.
   - *c. Elementary Schools.*
     - (1) Arguments: chiefly pedagogical.
       - (*a*) Psychological: full development of brain depends on sense perceptions and activity of hand and eye.

(*b*) Social: the transition from rural to city life and the development of large factories remove from the child the privileges of observing and participating in numerous activities that formerly furnished valuable factors in his education. Schools must supply this experience. This would also emphasize the dignity of manual labor.

(*c*) Artistic: arts and crafts movement emphasized. Design and decoration applied chiefly on wood and copper.

(2) Methods: kindergarten devices of Froebel in lower grades, Swedish sloyd in upper grades. Everything made must be useful.

(3) Results: manual training became established in public schools on a pedagogical basis, that is, as an educational factor, but failed to become a preparation of the worker for industrial pursuits.

4. **The Industrial-Education Movement.**

a. The Douglas Report, Massachusetts, 1906, disclosed the following:

(1) The deficiency of manual training.

(2) Children were leaving school in large numbers at an early age without sufficient "industrial intelligence" or definite training for wage-earning. "Blind alley jobs."

(3) The old-time apprenticeship system was practically extinct, and no substitute available for training workers.

(4) Low standard of industrial intelligence and technical skill made it difficult for American manufacturers to compete with European countries.

(5) Public schools are the only means of supplying this deficiency.

(6) The State was justified in fostering this kind of education because of higher type of citizenship thus produced.

(7) Precedent for state aid to this kind of education already existed in grants to normal schools, art schools, textile schools, and technical colleges.

(8) The demand for women workers in industry necessitated preparation for them to earn a decent living wage. Also emphasized necessity for instruction in home-making.

Recommended a system of independent industrial schools to avoid conflict with established school system.

b. Address by Dr. A. S. Draper, Commissioner of Education for New York, entitled "Our Children, our Schools, and our Industries."

5. **Rapid Growth of Interest in Industrial Education.**

National Society for Promotion of Industrial Education.

Manufacturers' associations.

Interest of organized labor.

Chicago Commercial Club and similar organizations.

Leadership of the state of Wisconsin.

Legislation in other states.

Commission on National Aid to Vocational Education, 1914.

The Vocational Education Act (Smith-Hughes law), 1917.

6. **Types of Public Industrial Schools.**

a. Trade schools: Worcester; Bridgeport; Yonkers; New Orleans; Manhattan (girls); Milwaukee.

b. Intermediate industrial schools, also called "vocational": Columbus, Georgia; Rochester; Albany; New York; Newark, New Jersey; Pittsburgh; Buffalo.

c. Prevocational schools or classes: Boston; Buffalo.

d. Vocationalized manual training.

e. Vocational high schools: Newton, Massachusetts; Jersey City; Portland, Oregon; Cleveland; Detroit.

f. Evening trade schools: Stuyvesant (New York City); Springfield, Massachusetts; Newark; Chicago; Philadelphia; Pittsburgh.

g. Coöperative or part-time schools: Cincinnati; Fitchburg, Massachusetts; York, Pennsylvania; Passaic, New Jersey; New York City; Los Angeles, California; Minneapolis; Seattle.

h. Technical high schools: very numerous.

i. Agricultural schools.

j. Household-arts schools.

7. **Private Industrial and Trade Schools.**

a. Schools for negroes, Indians, and delinquents.

b. New York Trade School; New York Electric School; Dunwoody Institute, Minneapolis; Williamson Trade School, Philadelphia; Wentworth Institute, Boston; David Rankin, St. Louis; Wilmerding, San Francisco.

c. Apprentice schools: R. Hoe & Co.; General Electric Company; United Shoe Machinery Company, Beverly, Massachusetts; Lakeside Press, Chicago; Santa Fe Railroad; Ford Motor Co., Detroit.

d. Secondary technical schools: Pratt Institute; Drexel Institute; Armour Institute; Carnegie Institute; Mechanics Institute, Rochester.

e. Correspondence schools.

f. Labor-union education courses: International Typographical Union.

g. Organized training by business firms: department stores; telephone companies; hotels.

8. **Practical Difficulties in introducing Industrial Education.**

a. Conservatism of traditional school ideas, hostility of school men, popularity of high school.

b. Apathy of public.

c. Fear of class distinction.

d. Lack of a clearly defined educational policy.

e. Lack of trained teachers.

f. Undesirable quarters for industrial schools.

g. Undesirable pupils gave a bad reputation.

9. **Movements allied to Industrial Education.**

a. Scientific management.

b. Vocational guidance.

c. Coöperation between employers and schools.

d. Community surveys.

e. Social legislation: child labor, eight-hour day, factory inspection, employers' liability, compulsory education.

f. Junior high school.

g. Continuation schools.

h. Rehabilitation of the disabled, both military and civil.

10. **Arguments for Public Vocational Education.**

a. Welfare of state demands highest possible productive capacity from every individual — "Conservation of human resources." Mere ability to read and write no longer sufficient.

b. National defense increasingly depends upon mechanical skill.

c. Successful competition of American manufacturers with foreign countries requires highest possible degree of skill in American workingman. Example of Germany before the war.

d. Apprenticeship system has been driven out by large-scale production, extreme division of labor, and migratory character of population.

e. Two million pupils leave school each year to go to work with no training and with no opportunity to secure training after entering industry.

f. These pupils, who constitute the majority, have the same right to receive training for their careers that the professional man has to receive at public expense the preparation necessary to enter the law school, medical school, normal school, or engineering college.

g. The development of huge factories with "No Admittance" signs removes from the youth of our cities the opportu-

nity of observing various industrial operations and trades and of thus being attracted to any particular trade as a life work. It is therefore the duty of the school to provide for pupils a large variety of industrial experience as basis for vocational choice.

DEFINITIONS

The term *manual training*, as generally used, refers to the woodworking shop work of an Americanized sloyd type which is now so common in the elementary schools of the country. It is sometimes used also to indicate the shop work in the general high school, which consists chiefly of simple cabinet-making projects and often includes printing and metal-working.

Industrial arts is a more comprehensive term than *manual training*. It generally denotes the different types of handwork used in the lower grades, such as textile work (weaving, basketry, etc.), clay work (plaster, concrete, etc.), simple metal work, or simple projects in agriculture. The purpose of this type of work is to introduce the pupil to the various great industries or groups of occupations of mankind as a matter of general education without either vocational or prevocational motive.

Vocational training, as defined in the Smith-Hughes law, is training which fits for profitable employment. Obviously neither manual training, industrial arts, prevocational training, nor the junior high school can qualify as vocational training.

Part-time schools, as the term is interpreted by the Federal Board for Vocational Education in *Bulletin No. 19*, are the schools now being provided by various states, in which the pupil under sixteen or eighteen years of age who has left school to go to work must return to school for six or eight hours a week during the daytime. Three different types of instruction are provided, as follows:

1. The *general-continuation school* offers instruction in general education for pupils whose elementary schooling has been deficient.

2. The *trade preparatory school* provides for pupils with a reasonable grounding in general education and who wish to be prepared for employment at some definite trade.

3. The *trade extension school*, in which the pupil employed at an occupation in which he wishes to continue may receive instruction supplementary to his trade.

The *coöperative school* is the arrangement sometimes called the two-boy plan or the Cincinnati plan or the week-about plan, in which the boys are paired, one boy working in the shop for a week while his partner is in school. The next week the two boys change places. This insures continuous work in the industry, and with the two groups of pupils the program of the school is not interrupted, the work of the one class being repeated the next week with the other class. The plan is called coöperative because it represents a close coöperation between the school and the industrial plants in which the pupils work.

The *vestibule school* is a new feature growing out of the war activities of industrial plants. The demand for immediate, large-quantity production necessitated the prompt training of large numbers of operatives for special machines or operations. So the industries established training departments in which applicants for employment were put into training for a few hours, a few days, or at most a few weeks, and taught to perform the required operations and turn out the largest possible quantity of products. This was obviously not a public enterprise, but was training given solely by and in the interest of the manufacturer, and was of the narrowest but most intense character.

Night schools, both public and private, have been conducted for many years and have offered instruction in all branches given in the day schools as well as in some subjects that are more adapted for more mature students. The primary purpose of evening-school work in industrial subjects is to provide for students who are employed during the daytime, who are therefore beyond the compulsory school age and who seek instruction that shall be supplemental to their daily employment. This latter limitation is especially required by the Smith-Hughes law.

Prevocational schools or *classes* aim to give the pupil, while still in the elementary school, an insight into several different industrial lines, such as woodworking, metal working, printing, electricity, or commercial practice. By spending a short term of work in each branch he is supposed to be able to decide which one he prefers to follow for his life work, his choice being subject to the approval of his instructors. When the choice is made and he begins instruction in his chosen line, it then becomes *vocational* training.

The *junior high school* is an attempt to combine the prevocational-experience idea with more careful and systematic vocational guidance. The philosophy of the junior high school is based upon the psychology of early adolescence. It aims to give new form, content, and objective

to the work of the seventh, eighth, and ninth grades. Its advocates protest vigorously against making it merely a superimposition of the first year of the ordinary high school upon the elementary school.

Trade schools have been conducted for many years as private institutions, but only recently have any important attempts been made to conduct public trade schools. In the real trade school the greater part of the time is devoted to shop work, with some instruction in trade drawing and trade mathematics closely related to the trade instruction. There is no attempt to give any instruction in the liberalizing, social, or cultural subjects.

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UNIT TWO

OBSERVATION OF TEACHING

This valuable factor in teacher-training is recognized generally by normal schools throughout the country, and teachers-in-training are required to visit schools and observe the work of experienced teachers. Usually this phase of the work comes after considerable study of other subjects in the training course, including principles of teaching and teaching-methods. It has been found possible and feasible to transpose this order and make this the first unit of the short discontinuous course for trade-teachers.

On one occasion the compelling reason for starting out the class of tradesmen in their teacher-training course with a unit on observation of teaching was the fact that the class was organized so late in the school year (February 1) that it was necessary to hasten this part of the work if it were to be done at all that season. These men were all employed during the daytime, and their visits to schools must be done when evening classes were in session; but the evening term in most schools of that community was nearly over. Therefore the visiting of schools was taken up first and organized into a definite unit of the course instead of being a supplementary feature as formerly.

The visitor to a school should have a definite objective. Teachers-in-training should also formulate their observations in written reports. Therefore, in order to aid these men in their observation and reports, which must be done under

pressure, there was prepared a list of suggestive questions relating to various phases of conducting trade classes. This list was broken up into ten groups, each dealing with some specific subject or phase which was the basis of observation on any one visit. The list of topics for observation and their arrangement is as follows:

1. Equipment
2. Materials and Supplies
3. Students' Work and Product
4. Classroom Conditions
5. System and Organization
6. Testing, Rating, and Promotion of Students
7. Class Management
8. Teaching-Methods
9. Lesson Planning
10. Organization of Subject Matter

Before making the first visit, a session was given to discussion of the matter, with special emphasis on the ethics or amenities of visiting schools, as follows:

1. Always go first to the office, call for the principal or director, state frankly your purpose, and request permission to visit the class.

2. Remember that the instructor's primary duty is to take care of his class, not to talk with visitors. Do not encourage him to give you attention during the class period.

5. Do not be in haste to ask questions. Use your eyes and ears.

4. Do not engage in conversation with students. An occasional brief question may not be resented, but prolonged conversation will surely irritate the instructor.

5. Keep your outline out of sight. An instructor does not like to feel that he is being "inspected."

6. Avoid disparaging criticisms, either of work observed or of other affairs or persons. Practice the golden rule.

7. Win the good will of the instructor if possible. Commend the good things you see. Express your appreciation of his courtesy. Be a good fellow with him after class.

Each man was then given a mimeographed copy of questions covering points to be observed on the visit, answers to which were to be written out in report form to be read before the class at the next session. These reports were later turned in to the instructor to be rated.

Just as far as possible the men were required to visit a different school each time. In any case where there were not ten different classes in any trade to be found within reach, it was suggested (with emphasis) that in repeating visits to any one school, as long an interval as possible should elapse in order to compel a distribution of visits among all the schools accessible. Also a selection could thereby be made of the schools having specially strong features which would be profitable for closer observation in another visit if the program permitted a second visit to any school.

As the training-class sessions were held on Monday and Wednesday nights, the visiting and observation had to be done on Tuesday, Thursday, and Friday nights. Notwithstanding this time limitation the results of the work conducted in this manner were highly satisfactory. It is recommended as being an excellent method of starting with the work of such a class. It should begin if possible earlier in the season, so that two evenings of discussion could be given to each visit. It should not, however, start too soon before the term's work in the classes visited is well under way.

The complete set of the ten report outlines is given herewith.

OBSERVATION OF TEACHING: REPORT

NAME _____

SCHOOL VISITED _____

DATE OF VISIT _____

CLASS VISITED _____

NAME OF TEACHER _____

Answer the following questions in report form; that is, with brief explanation. Do not use mere "yes" or "no." Make free use of illustrative sketches. Attach this sheet to your report.

REPORT NO. 1

EQUIPMENT

1. Give a list of machines with brief description of each.
2. Are machines and tools up-to-date?
3. Is the layout of machines good?
4. What changes in layout would you suggest?
5. Is the lighting adequate?
6. Is the outfit of small tools adequate?
7. Is the tool room conveniently located?
8. Are all tools well arranged?
9. What system is used for checking tools?
10. Are the lecture seats conveniently arranged?
11. Are there suitable provisions for students' clothing etc.?
12. Are all dangerous machines properly safeguarded?

OBSERVATION OF TEACHING: REPORT

NAME .....

SCHOOL VISITED .....

DATE OF VISIT .....

CLASS VISITED .....

NAME OF TEACHER .....

Answer the following questions in report form; that is, with brief explanation. Do not use mere "yes" or "no." Make free use of illustrative sketches. Attach this sheet to your report.

REPORT NO. 2

MATERIALS AND SUPPLIES

1. What materials (not tools) do students use?
2. Are the materials of the same grade and quality as used in a commercial shop?
3. How are supplies secured; that is, does the instructor buy direct from dealers, or does he have to send requisitions through his principal to the purchasing department of the Board of Education?
4. Is an official requisition blank provided?
5. Does the instructor know the cost of the supplies used in his shop?
6. How are supplies stored?
7. How are supplies issued to students, by written requisition of student or by written order of the instructor? Does the instructor hand over materials to students, or do they help themselves?
8. Do students pay for any or all of the material they use?
9. How is the amount of payment determined?
10. Do students bring in any of their materials?
11. Is there a live inventory of stock?

OBSERVATION OF TEACHING: REPORT

NAME _____

SCHOOL VISITED _____

DATE OF VISIT _____

CLASS VISITED _____

NAME OF TEACHER _____

Answer the following questions in report form; that is, with brief explanation. Do not use mere "yes" or "no." Make free use of illustrative sketches. Attach this sheet to your report.

REPORT NO. 3

STUDENTS' WORK AND PRODUCT

1. Do students perform work of an exercise or drill type, or do they turn out a real, usable product?

2. Is the product of commercial size, quality, and design?

3. Is it produced in quantities or in single pieces?

4. Is the workmanship good, judged by commercial standards?

5. How is the product disposed of?

6. What proportion of the product is spoiled?

7. What efforts are made to utilize stock from spoiled work?

8. Do you think reasonable economy is exercised in the use of materials?

9. Do you think the shop could turn out more commercial product?

10. Do you think the work done by students is suited to their instruction needs and to the purpose of the school?

OBSERVATION OF TEACHING: REPORT

NAME _____

SCHOOL VISITED _____

DATE OF VISIT _____

CLASS VISITED _____

NAME OF TEACHER _____

Answer the following questions in report form; that is, with brief explanation. Do not use mere "yes" or "no." Make free use of illustrative sketches. Attach this sheet to your report.

REPORT NO. 4

CLASSROOM CONDITIONS

1. How many students were in the class?
2. Was the temperature of the room suitable for the work being done?
3. Was the ventilation good with reference to noxious gases, drafts, pure air, etc.?
4. Was the room neatly or slovenly kept?
5. Were the exhibits of students' work neatly arranged?
6. Were the wall charts, sample boards, etc. up-to-date or antique?
7. Was there suitable provision for students to wash their hands?
8. Was there ample room for each student to work?
9. Did the instructor have an unobstructed view of his class from all points in the room?
10. Was there adequate blackboard space?

OBSERVATION OF TEACHING: REPORT

NAME _____

SCHOOL VISITED _____

DATE OF VISIT _____

CLASS VISITED _____

NAME OF TEACHER _____

Answer the following questions in report form; that is, with brief explanation. Do not use mere "yes" or "no." Make free use of illustrative sketches. Attach this sheet to your report.

REPORT NO. 5

SYSTEM AND ORGANIZATION

1. Is there in evidence by wall chart, card index, record book, or otherwise, a scheme for analyzing and classifying jobs to be assigned to students?

2. Is there a system to regulate the assignment of jobs?

3. Are lessons outlined in definite sequence?

4. Are there *conspicuous* records showing progress of students?

5. What system is used for keeping the shop tidy?

6. What system is used to check up tools?

7. How is the attendance record kept?

8. Is there a system for promoting attendance and punctuality?

9. Are the systems in use devised by the instructor or prescribed by the director or school officials?

10. Are the systems in use readily understood by students?

11. How much time of the instructor is required outside of class hours in working out his various system schemes?

12. Does the instructor impress you as being systematic or careless?

13. Do you think the matter of system is overdone?

14. Did you observe any features that might be improved by more system?

OBSERVATION OF TEACHING: REPORT

NAME _____

SCHOOL VISITED _____

DATE OF VISIT _____

CLASS VISITED _____

NAME OF TEACHER _____

Answer the following questions in report form; that is, with brief explanation. Do not use mere "yes" or "no." Make free use of illustrative sketches. Attach this sheet to your report.

REPORT NO. 6

TESTING, RATING, AND PROMOTION OF STUDENTS

1. Are students checked carefully with reference to variety of work?
2. Are students checked carefully with reference to quality of work?
3. What system of grading or marking is used (for example, Excellent, Good, Fair, Poor; percentage; A, B, C, D; Satisfactory, Unsatisfactory)?
4. What standards are set for accomplishment by students?
5. What kinds of tests or examinations are used for shop work?
6. What kinds of tests or examinations are used for related technical work?
7. What scheme is used for recognizing the attainments of students; that is, is a pass card issued at the end of the term, or is a certificate awarded for the completion of a given unit of work regardless of time?
8. Are students' ratings or credentials made public?
9. Is the promotion of the student dependent upon the progress of the class as a whole or does he proceed individually?
10. What are the alternatives of the student who is rated as unsatisfactory or as having failed in any subject?

OBSERVATION OF TEACHING: REPORT

NAME _____

SCHOOL VISITED _____

DATE OF VISIT _____

CLASS VISITED _____

NAME OF TEACHER _____

Answer the following questions in report form; that is, with brief explanation. Do not use mere "yes" or "no." Make free use of illustrative sketches. Attach this sheet to your report.

REPORT NO. 7

CLASS MANAGEMENT

1. What was the procedure in assembling and setting the class to work?
2. What improvements would you suggest on this point?
3. What was the procedure in closing up work and dismissing the class?
4. What changes or improvements would you suggest on this point?
5. Was a lecture given to the class? If so, describe the method used.
6. Had the instructor prepared a definite plan for conducting the lesson which you observed?
7. Was the instructor reasonably alert throughout the session?
8. Was the instructor the master of the situation at all times?
9. Was there any confusion or disorder? If so, to what do you attribute it?
10. What disciplinary features did you observe (that is, devices for controlling students, incidents of personal attention to students' conduct, etc.)?
11. What appeals to students did the instructor use (that is, instincts of acquisition, rivalry, or competition, pride in good workmanship, desire for approbation, self-interest and future possibilities, civic and economic values, etc.)?
12. Was the attitude of the instructor toward his students inspiring or depressing? cordial or reserved? respectful or sarcastic? commendatory or nagging? friendly or antagonistic? firm or lax?

OBSERVATION OF TEACHING: REPORT

NAME _____

SCHOOL VISITED _____

DATE OF VISIT _____

CLASS VISITED _____

NAME OF TEACHER _____

Answer the following questions in report form; that is, with brief explanation. Do not use mere "yes" or "no." Make free use of illustrative sketches. Attach this sheet to your report.

REPORT NO. 8

TEACHING-METHODS

1. How was the subject matter presented to students (that is, by use of drawings, instruction sheets, textbooks, reference books, lectures, individual explanation)? Explain the use made of each.

2. Did the instructor perform an experiment or give a demonstration before the class? for the individual student?

3. Did the instructor perform operations on the students' work or on separate pieces of work?

4. Did the instructor tell the student how, or did he suggest questions leading the student to think out reasons and methods for himself?

5. Was the sequence of problems or tasks arranged in the order of learning-difficulty?

6. Were the specific aims for each lesson or job clearly stated by the instructor either orally or on instruction sheets? In other words, did the student understand what instruction benefit he was expected to derive from the job or experiment which he was doing?

7. What means were used to enable the student to develop skill or ability in performance?

8. What means were used to enlarge the student's understanding or stock of related information?

9. State which of the following processes of learning you think the instructor depended upon the most: trial and error, imitation, reasoned cause and effect.

10. Were students assigned questions for further study?

OBSERVATION OF TEACHING: REPORT

NAME _____

SCHOOL VISITED _____

DATE OF VISIT _____

CLASS VISITED _____

NAME OF TEACHER _____

Answer the following questions in report form; that is, with brief explanation. Do not use mere "yes" or "no." Make free use of illustrative sketches. Attach this sheet to your report.

REPORT NO. 9

LESSON-PLANNING

1. Do you think the instructor had prepared a definite plan for conducting the lesson which you observed?
2. Was the plan suited or unsuited to the student? to the subject?
3. How would you change or modify the plan?
4. What was the specific aim or objective for the lesson?
5. Were specific aims for the series of lessons, or jobs clearly stated in any way (that is, in instructor's plan book, on instruction sheets, job orders, etc.)?
6. Does the instructor keep a plan book?
7. Do his lesson plans indicate the manner of approach or the establishment of a point of contact with the student?
8. Do they indicate the method of presenting the subject to students?
9. Do they indicate how the student is to proceed in applying the instruction?
10. Do they prescribe any test to determine to what extent the student has mastered the lesson?
11. Does the lesson plan or instruction sheet prescribe readings or suggest references for further study by the student?

OBSERVATION OF TEACHING: REPORT

NAME _____

SCHOOL VISITED _____

DATE OF VISIT _____

CLASS VISITED _____

NAME OF TEACHER _____

Answer the following questions in report form; that is, with brief explanation. Do not use mere "yes" or "no." Make free use of illustrative sketches. Attach this sheet to your report.

REPORT NO. 10

ORGANIZATION OF SUBJECT MATTER

1. What were the main divisions of the course as given in this class?
2. How were these main divisions again subdivided?
3. Were these divisions and subdivisions displayed on wall charts, printed in school catalogues, or otherwise published for the attention of the students?
4. Was the organization of the course worked out by the instructor teaching it, or was it prescribed by the authorities of the school?
5. Were the divisions of the subject based upon time units or upon natural factors of the trade?
6. How did the divisions of the subject in the school differ from the divisions commonly recognized in the trade?
7. Was the sequence of jobs given to students based upon production convenience or upon learning-difficulty?
8. How were instruction units (lessons) finally determined?
9. Were students required to follow a fixed sequence of units, or could they elect various units to suit individual preference?
10. In case of practical job work how was the instruction content evaluated and arranged? that is, how did the instructor determine that a given job should be assigned to a student at a particular time, and what means did he use to indicate the credit for this job with reference to the student's whole course and in terms of learning-values?

This unit proved to be organized according to sound pedagogical principles, as follows:

1. It was started with a topic with which each man was familiar; namely, equipment. Being acquainted with the tools and machines in his own trade, he had sufficient apperceptive basis for observing the equipment in the school shop.

2. One immediate advantage of the observation unit was in giving to the men a method of procedure at the outset which was within their ability to perform. They enjoyed the visits, both because of their motive and because they were cordially greeted by the teachers whom they met. Moreover, the questions in the outline proved to be stated in a manner which made it easy to write out the report. For future teachers, who must do much written organizing of their work, this was an easy initial step.

3. The reading of these reports in class and the free discussion which was encouraged at the outset revealed defects in the use of English, and at the close of each session a few minutes were given to pointing out these errors in an impersonal manner that would not give offense. Members of the class were encouraged to note errors as they were made during the session and to mention them at the time given to this matter. Thus they educated each other in a most effective manner. It was interesting to note how quickly conspicuous slang expressions and glaring errors in grammar were eliminated. The instructor alone could not, in a three years' course, have accomplished the corrective results in the use of English that were achieved in ten sessions by the simple expedient of turning the men loose upon each other. A little good-natured bantering, carefully controlled, was a valuable factor in this achievement and also aided in developing a spirit of fellowship in the class.

4. The reading of reports in class developed a spirit of rivalry. In the first session devoted to this feature two or three excellent reports were offered which served as models. Each man thereafter endeavored to present his report in the best possible manner in order not to be outdone by any other. Failure to have a report ready was frowned upon by the class as a whole, and the good-humored raillery received by the delinquent man from his fellows proved a wholesome deterrent in this matter.

5. The fact that the men did so much of the talking made the conduct of the class an easy matter for the instructor. With the report outlines prepared, the class program consisted of calling the roll (promptly on time), of calling for reports and discussions (about an hour and a half), correcting errors in English (five to ten minutes), and, for the remainder of the period, passing out outlines for the next report, with brief discussion of these by the instructor. In other words, this unit on observation of teaching was of maximum value and interest to the class, and was carried on with a minimum of effort on the part of the instructor.

6. The sequence of topics for observation led inductively to the subject of trade analysis, which was the next unit of the course. It was with much surprise that these men discovered through this systematic observation of evening trade classes that there was in actual practice a woeful lack of organization, both of teaching-methods and of subject matter. They soon realized that most of the teachers in charge of the classes had had little or no training for teaching, and the value of the training-course was thus emphasized. They were therefore brought up to the subject of trade analysis with a full realization of its importance to themselves as prospective teachers of trade work.

UNIT THREE

TRADE ANALYSIS

Trade analysis has been ably presented by Charles R. Allen in his book "The Instructor, the Man, and the Job," which should be in the hands of every trade-teacher, actual or prospective. The lessons suggested in this unit are based upon Mr. Allen's book, from which definite study assignments are prescribed. The notes here added are intended to be supplementary.

It is assumed that the members of the class have been prepared in the unit on Observation of Teaching to enter upon the trade-analysis work. The observations are reviewed and summed up as an introduction to the analysis study.

The method of making definite assignment of written work to be prepared for the next session has been found most effective. At the opening of the class let several men write out their work on the blackboard. This gets the matter before the whole class for consideration. The written work of three or four men representing different trades usually furnishes abundant material for a session's discussion. It gives a good basis for comparison of ideas and for bringing out fundamental principles equally applicable to all trades. The use of the blackboard gives opportunity for revision and rearrangement into more satisfactory forms. Working out material in this way with the class is more effective than requiring written work, to be turned in to the instructor and returned with his corrections.

Lesson 1. The Importance of Trade Analysis

1. What strong or excellent features have you discovered in visits to trade classes and in observation of trade-teaching?

2. What conspicuous weaknesses or shortcomings have you found?

3. Bring out the difference between the trained and the untrained instructor by arranging the points suggested into two columns headed, respectively, "The Untrained Teacher" and "The Trained Teacher," somewhat as follows:

The Untrained Teacher	The Trained Teacher
1. Has not learned trade of teaching (may have practiced it, but has not learned it).	1. Has learned how to teach. How? Possible methods of learning. *a*. Pick up (trial and error). *b*. Apprenticeship. *c*. School training.
2. Tries to do all the work himself.	2. Gets reaction from his students (application and testing).
3. Is unable to take account of his stock of knowledge.	3. Has carefully analyzed the subject which he teaches.
4. Is unable to classify his knowledge; that is, to arrange it in teaching-order.	4. Has his lessons graded according to student's ability to learn.
5. Does not distinguish between teaching and merely giving information.	5. Comprehends the several phases of the teaching process.
6. Does not know how to plan so as to give the student the right thing at the right time.	6. Provides for presentation of each thing, fact, or principle at the proper time.
7. Does not know how to keep students at work. Wastes their time.	7. Economizes and conserves students' time.
8. Does not teach thoroughly.	8. Is thorough in whatever he presents.
9. Does not know how to arrange instructional surroundings.	9. Has equipment and material properly arranged.

4. In order to teach any subject one must first analyze it. The skilled mechanic performs much of his work without conscious thought; the operations involved in his trade have by frequent repetition and fixed habit become "second nature" to him. He has never attempted to relate the sequence of fundamental motions in performing any given job, however common or simple it may be. He could not even describe completely the everyday performance of putting on his shoes. Unaware of his subconscious mastery of his trade and not appreciating the learning-difficulties of his apprentice, he pronounces unreasonable judgment upon the boy's shortcomings. In reality the fault lies with the master, who has shot over the boy's head instead of detailing his instructions within the boy's comprehension.

It is almost axiomatic to say that a man cannot teach a trade that he does not know; it is equally self-evident that in order to teach what he does know, he must analyze the subject. He must be able to recognize the main divisions of his trade and again break up each of these divisions into its subdivisions, which must then be arranged in the order of learning-difficulty. The instructor must distinguish between the production order of operations for any job and the instruction order, in which operations should be given to a learner so that he can master the whole series with the least expenditure of time and energy. For each operation he must specify the materials and tools needed, the particular auxiliary or technical information involved, and the related trade terms, safety precautions, items of trade judgment, etc. Until a mechanic can thus analyze his trade from the teaching standpoint, he should not be permitted to attempt the teaching of it; nor is any course of instruction in a trade subject properly organized until it has been thus analyzed.

5. The first step in analysis is to delimit the field. Distinguish between an industry, such as the machine industry, the building industry, the textile industry, the printing industry, etc.; a trade within an industry, such as that of molder, plasterer, tailor, compositor; and a branch of a trade, such as the work of the lathe hand, the buttonhole-maker, the lather, the press-feeder. The smaller the field the simpler will be the analysis.

In the vocational or trade school the organization is usually based upon a *trade*, and the analysis work of this course should be done upon the same basis. Let each teacher-in-training determine, first, the industry to which he belongs; second, his trade within the industry; and, third, his specialty within the trade, if he has any.

6. **Assignment.** Write out a list of twenty-five different kinds of jobs that a man in your trade has to do.

7. **Reading.** Allen's "The Instructor, the Man, and the Job," pp. 36–63.

Lesson 2. Type Jobs in a Trade

1. Have three or four men representing different trades write out on the blackboard their lists of jobs as per assignment in the previous lesson.

2. Invite the class to inspect these lists and distinguish between a *type job* and a *specific job*. The type job represents the fundamental process or operation that can be applied to many specific jobs, while several different specific jobs might involve the same type job.

For example, the electrician obtains a contract to install a bell-signal system in a hotel. This is a specific job. Installing a bell-signal system with gravity-drop annunciators to call from twenty-five different stations, with return calls,

represents a type job based upon fundamental operations which might be performed in a number of different kinds of buildings. For a carpenter a type job is laying out an angle of 45 degrees with a steel square. When he has learned this principle he can apply it in specific jobs wherever necessary, whether laying out a half-pitch rafter or making a miter joint. For the machinist, cutting a V-thread is a type job; for the plumber, wiping a lead-pipe joint; for the printer, setting type in the composing-stick. In order to analyze the trade into its elements without repetition, only type jobs should be mentioned.

3. Bring out the first principle: *Trade analysis must be based upon type jobs.*

4. **Assignment.** Write out all the *type jobs* in your trade that you can think of.

5. **Reading.** Allen's "The Instructor, the Man, and the Job," pp. 64–74.

Lesson 3. Classification of Type Jobs: Trade Blocks

1. Have three or four men write on the board their list of type jobs.

2. Inspect and verify these lists.

3. Analyze a few jobs to determine the *job elements*, such as kind of material, tools, or machines; operations or manipulation; trade terms; calculation; trade judgment; accuracy, speed, fear, danger, complexity, visualization.

4. In each job try to identify the three kinds of elements:

a. Elements common to all other jobs in the trade, constituting the trade basis.

b. Elements common to some other jobs in the trade, constituting the group or block basis.

c. Elements common to no other jobs in the trade, constituting the lesson basis; that is, new teaching-points. Each element is a "learning-difficulty." Use the analogy of prime factors in mathematics.

5. Group the various jobs according to *b* and give a characteristic name to each group; that is, a name that describes or signifies all the elements in the group. For example, a machinist does the following jobs:

a. Centers stock for turning.
b. Drills holes on drill press.
c. Drills holes on lathe.
d. Cuts threads.
e. Planes flat surfaces on planer.
f. Planes flat surfaces on shaper.
g. Cuts T-slots on planer.
h. Lays out holes on castings.
i. Faces off ends of cylindrical pieces held in face plate.
j. Bores out large holes in work held in face plate or chuck.
Etc.

In examining this list we recognize that jobs *a*, *d*, *i*, and *j* are all done on the lathe; jobs *b* and *c* are done on the drill press; jobs *e*, *f*, and *g* are done on the planer or shaper; job *h* is done at the bench.

This suggests the grouping of the machinist's work into blocks or divisions of lathe work, drill-press work, planer work, and bench work. In continuing the list of type jobs, other groups or blocks will be suggested. The final list must include all the jobs or operations that the machinist performs, properly classified without omission or repetition.

Furthermore, it is desirable to recognize the basis of this grouping. In the case of the machinist's jobs we find that the classification is determined by types of machines or opera-

tions; in electrical work by types of wiring; in carpentry by types of constructions; in printing by types of operations; etc. For each trade it is essential to determine the block basis before accepting the grouping as final. In some cases two block bases may be necessary, as in plumbing, where types of operations and types of materials must both be recognized, neither one alone being sufficient to account for all the jobs or operations that the plumber has to do.

6. Bring out the second principle of analysis: *Type jobs in a trade must be grouped according to the elements or characteristics common to some jobs but not to all.*

7. **Assignment.** Arrange the *similar* type jobs in your trade in groups and give to each group a characteristic name or title; that is, one indicating the basis of the grouping.

8. **Reading.** Allen's "The Instructor, the Man, and the Job," pp. 77–96.

Lesson 4. Arranging Type Jobs in the Order of their Difficulty: Progression-Factors

1. Have three or four men each write out on the blackboard two or three blocks with titles and list of jobs in each block.

2. Examine these lists to determine the consistency or validity of grouping and title.

3. Analyze two or three blocks into prime elements, then try to arrange the jobs in their order of learning-difficulty as determined by these elements. Distinguish between "learning-difficulty" and "production-difficulty." The elements determining the difficulty of a job are Allen's "progression factors." Distinguish between progression-factor elements and classification elements.

In establishing the relative difficulty of a job in order to place it in an instruction order, first determine what elements or *factors* enter into the job as learning-difficulties, then arrange the order of jobs so that the student progresses by uniform, gradual stages from jobs where these factors are least intense to jobs where they are most intense. A job whose factors are predominantly near the minimum side of the scale is obviously easier than one the majority of whose factors lie near the maximum. The following table suggests possible graduations of some common progression factors. Not all factors are applicable to every job.

PROGRESSION-FACTOR TABLE

Factor	Minimum — Maximum
Speed	*Very slow — slow — moderate — fast — rapid — swift* A quantitative factor applied wherever time is an important consideration.
Fear	*Fearful — timid — cautious — confident* Important where there is danger or hazard to the worker.
Accuracy	*Many errors — less errors — few errors — no errors* A quantitative factor in simple, repetitive operations, such as feeding a printing-press.
Precision	*Very coarse — coarse — approximate — fine — exact* Applicable in a single job of large proportion or nonrepetitive, such as preparing make-ready and register at the press; laying out lines for electrical conduits, water pipes; etc.
Number of successive motions . .	*Single motion — few motions — many motions* Applied to the complete cycle necessary for one repetitive job or operation. Example: setting a line of type either by hand or machine, or cutting a thread on a lathe.

PROGRESSION-FACTOR TABLE (CONTINUED)

FACTOR	MINIMUM MAXIMUM
Number of simultaneous motions	*Few — several — many* Applied to the motions necessary at almost the same instant in any operation.
Complexity	*Simple — multiple — involved* The number of factors or parts of a machine or stock to be considered in setting up, adjusting, or operating.
Judgment	*No alternatives — few alternatives — several alternatives — many alternatives* The choice of action possible in any situation. The job with no alternatives is "fool proof," while the one with unlimited alternatives represents the highest type of craftsmanship.
Manipulation	*Easy — less easy — difficult — very difficult* The muscular coördination required in any operation. EXAMPLE: card stock is relatively easy to manipulate, while tissue paper is difficult to handle.
Workmanship	*Rough — coarse — fair — fine — very fine — expert* Qualities such as neatness, finish, etc., necessary in any job; the masterful touch that characterizes the skillful worker in any line.
Visualization	*All elements visible — many elements visible — few elements visible — no elements visible* Ability to construct in advance a mental image of the completed job. Necessary in make-ready, imposition, and layout, for the printer; in constructing or reading working drawings in any trade.
Color discrimination	*Black and white — primary colors — hues and tones* Applies in feeding a printing-press, tempering steel, recognizing stock, etc.
Touch discrimination	*Rough — fine — delicate* Applied in testing paper stock; in finishing surfaces in wood, metal, varnish, etc.

Other factors that may be analyzed in a similar manner are sound discrimination, foresight, creative imagination, calculation, etc.

4. Bring out the third principle of analysis: *All the type jobs within a group must be arranged in the order of learning-difficulty wherever a sequence is evident.*

5. **Assignment.** Arrange all your groups and the jobs within each group in an order of learning-difficulty, placing the simplest first and the most difficult last, with all others graded between. Determine the various progression factors entering into the arrangement.

6. **Reading.** Allen's "The Instructor, the Man, and the Job," pp. 45–63.

Lesson 5. Analyzing a Job into its Contents — Production, Auxiliary, and Technical

1. Have two or three men each write on the blackboard one group, with type jobs arranged in the order of learning-difficulty, as per previous assignment.

2. Examine the blackboard work and identify the factors which determine the sequence of the jobs throughout the group.

3. With a job from one group, show the class how the various factors may be analyzed; namely, (1) *production factors*, including operations, tools, equipment, and materials; (2) *auxiliary factors*, including recognition of stock and knowledge of its working properties, care of tools and equipment in use and not in use, trade terms, and safety precautions; (3) *related technical factors*, including trade calculations, trade-drawing, and trade science.

4. Bring out the fourth principle of analysis: *Each job must be analyzed into its various factors or contents*,

(1) production content (doing), (2) auxiliary content (knowing what), and (3) related technical content (knowing why).

5. Show how to arrange this analysis scheme in chart form. See chart of trade-analysis plan opposite page 40.

6. **Assignment.** From your outline select one block to be analyzed in detail and carried through step by step to completion. For each job in this block, write out *all the operations* that have to be performed in doing the job.

7. **Reading.** "Analysis of the Machinist's Trade," *Bulletin No. 52*, Federal Board for Vocational Education. Teachers of printing should also read "Teaching Apprentices in Printing Trades," published by the United Typothetæ of America, Chicago, Ill.

Lesson 6. Production Content: Tools, Equipment, and Materials

1. Have three or four men write out their lists of operations as per previous assignment.

2. Inspect these lists of operations to be sure that each is stated in simple, elemental form.

3. Develop more clearly the analysis of a type job for tools and equipment and materials.

4. **Assignment.** For each job in the block, write out all the tools, equipment, and materials necessary.

Lesson 7. Analysis of Auxiliary Content for Knowledge of Stock

1. Inspect lists from previous assignment as written out on the blackboard by three or four men.

2. Develop the analysis of the job for knowledge of stock, both as to recognition and working qualities.

This has been found one of the most vital topics in the course. Many workmen recognized as experts in their respective trades are surprised to discover at this point their inability to describe in words the obvious physical properties of the materials with which they are so familiar. This ability is essential for the good teacher, and sufficient time and drill should be devoted to it in the training-class. In recognition of stock much help will be found in considering the perceptions of the five physical senses — seeing, feeling, hearing, smelling, and tasting. For any given kind of stock, ask: "*What* does the eye see?" "*What* do the fingers feel?" "*What* do the ears hear?" etc. For working properties, consider the different operations that *may* be performed on the stock, and describe what happens in each case.

3. Bring out the different *facts that a workman must know* in order to do the job.

4. **Assignment.** Write out the analysis for recognition of stock and working properties of stock for each type job in the block.

Lesson 8. Analysis of Auxiliary Content for Trade Terms and Safety Precautions

1. At the blackboard inspect the written work of three or four men on the last assignment.

2. Bring out the trade terms involved in a job by referring to the assignment sheets already worked out. Every trade term already used should be written again under this heading. Many trade terms that may not have been written before will be discovered. Watch for correct spelling.

3. Safety precautions should be especially emphasized. This is a matter of utmost importance to the shop-teacher.

Each precaution connected with a job should be carefully written out. Consider especially the progression factors of danger and fear.

Suggest the collection of accident-prevention literature issued by various casualty, bonding, and insurance firms, by the American Museum of Safety, etc. Each teacher-in-training should here begin the accumulation of such material and should continue its collection throughout his teaching career.

4. **Assignment.** Write out all the trade terms and safety precautions involved in the various jobs in the block.

Lesson 9. Analysis of Technical Content: Trade Calculations

1. Inspect at the blackboard the written work of three or four men on the last assignment.

2. Develop the idea of analyzing the calculations or mathematical operations connected with a job. Distinguish between schoolroom method and actual trade methods of calculations. Only the latter should be considered.

3. Bring out the fundamental mathematical operations involved to show what subjects require drill. For example, if no decimal fractions were involved, the student learning the job would not need drill on decimals in the classroom. Or if the performance of the job required the use of proportion, then students learning this job should be drilled on proportion.

4. **Assignment.** Write out all the calculations that a workman *must* perform in doing each of the type jobs of the unit.

Lesson 10. Analysis of Technical Content: Trade Science

1. Inspect at the blackboard the written work of three or four men on the last assignment.

2. From some of the examples bring out the principles of science related to the job which a workman should understand in order to do the work intelligently.

In order that there may be some systematic method of procedure, let each man check against an outline of the various branches of science the topics which he finds applied in his trade. The tables of contents in textbooks on physics and chemistry will be found of assistance. These books may be found in any public library.

3. **Assignment.** Write out the principles of science related to the various jobs in the block and show the specific application of each.

Lesson 11. Analysis of Technical Content: Trade Drawing

1. Inspect at the blackboard the written work of three or four men on the last assignment.

2. Bring out the idea of the use of drawings in modern industry as a means of giving directions for performing work.

3. Bring out the difference between reading a drawing, making a sketch, and making a finished mechanical drawing to scale, and show where each is necessary in performing the type jobs given.

4. Discuss the various conventions used in drawings for different types of work, using the blackboard work for examples.

5. **Assignment.** Write out the drawing content of each type job, showing (1) whether it is necessary to read, sketch,

or make finished drawings, and (2) the specific conventions of drawing that the workman must understand in connection with the job.

Lesson 12. Analysis of Technical Content: Trade Judgment

1. Inspect at the blackboard the written work of three or four men on the last assignment.

2. Bring out the idea of the trade judgment required in doing jobs. Judgment involves the selection of alternatives. A situation in which the worker can do only one thing is "foolproof." Where there are two possible things for him to do, one right and the other wrong, he exercises good judgment in selecting the right thing or bad judgment in selecting the wrong thing. The greater the variety of alternatives and of combinations of elements which may be selected by the worker in his actions, the more complicated and important is the matter of judgment. Consider the carpenter using a plane with a dull cutter. He may continue to grub away with the tool in this condition and getting worse, thereby doing poor work with much effort; or he may stop and sharpen it, by that means performing good work with less effort. Here is a choice of two alternatives. To sharpen the tool is a matter of good judgment; to continue to use it dull is poor judgment. Beyond the specific habits in repetitive work, which may become largely automatic (like feeding a printing-press), the mechanic's work is largely a matter of judgment. Out of a variety of possibilities in any situation, he must select the procedure and materials for the accomplishment of his purpose.

3. **Assignment.** Write out the various items of trade judgment involved in performing the type jobs in the block.

BLOCK _____

TRADE ANALYSIS PLAN

CHECKING LEVELS	TYPE JOBS ARRANGED IN THE ORDER OF LEARNING DIFFICULTY	PRODUCTION CONTENT			AUXILIARY CONTENT							RELATED TECHNICAL CONTENT			TRADE JUDGMENT	SPECIAL
		OPERATIONS	TOOLS AND EQUIPMENT	MATERIALS	TRADE TERMS	KNOWLEDGE OF STOCK: RECOGNITION	KNOWLEDGE OF STOCK: WORKING PROPERTIES	CARE OF TOOLS AND EQUIPMENT: IN USE	CARE OF TOOLS AND EQUIPMENT: NOT IN USE	SAFETY FIRST	TRADE MATHEMATICS	TRADE DRAWING	TRADE SCIENCE		
—	1	1 2 3 4 ETC													
	2														
	3														
2	4														
	5														
3	6														
	7														
4	8														

4. **Final Assignment.** Write out in chart form a summary of all the previous assignments of this unit. The Trade Analysis Plan shown herewith will be found helpful. The chart should be made on a sheet of sufficient size, at least three feet wide by two feet high, and on strong paper, so that it can be posted up in the shop in a conspicuous place for students to examine. When they recognize that their instructor has carefully surveyed and charted their instruction path they will render him due respect and pursue their course with much greater zeal than would be the case if the preparation of their learning route were not much in evidence.

UNIT FOUR

PRINCIPLES OF TEACHING

Having analyzed their trade in such a form as to serve as a reservoir from which to draw subject matter for teaching, and with some attempt at arranging type jobs in an order of learning difficulty, our teachers-in-training are now ready to take up the analysis of another phase of the teaching-job; namely, the teaching-process or how to teach.

This unit should follow immediately after the unit on trade analysis. In anticipation of beginning the new unit, a week or so in advance the class should be assigned the reading of Allen's "The Instructor, the Man, and the Job," pp. 117–144.

The work of this unit should cover from eighteen to twenty sessions and include the following lesson topics:

I. The Teaching-Process
II. Instruction Devices
III. The Teaching-Unit — The Lesson
IV. Teaching a Lesson in Shop Work
V. Lesson-Planning and Trial Teaching
VI. Class Management
VII. Ethics of the Teaching-Profession

Lesson I. The Teaching-Process

The aim of this lesson is to summarize briefly the fundamental principles of pedagogy as a foundation for their specific application to the teaching of shop work. Trade-teaching

can be satisfactorily performed only in accordance with the underlying laws of learning and of teaching that modern pedagogy has come to recognize, and upon which is based all good teaching, whether it be of academic subjects or of shop work.

FACTORS OF TEACHING

In the teaching-situation the following factors should be recognized :

1. The learner.
2. The lesson — thing to be learned.
3. The objective or aim — advantage to be gained from learning.
4. The motive for learning — reason why the learner pursues the lesson.
5. The learner's foundation for receiving the lesson — previous experience (apperception).
6. The teaching-material — equipment and facilities for teaching.
7. The teaching-method — how to present the material.
8. The instructor — the one who directs the whole matter.

Teaching is defined as *purposeful effort to help a learner to learn.* This means that the aim and end of teaching is concerned with the learner, and the methods and subject matter of teaching must be organized from the standpoint of his needs and the process by which he learns. It further means that the teaching-process is not complete until the learner has satisfactorily mastered the new act of skill or fact of knowledge involved in the lesson. It is the teacher's duty, therefore, to make sure by the various devices of his art that the student has attained the ends set up in the lesson. Mere

telling or showing does not constitute teaching. The instructor is responsible not only for presenting the information but also for controlling the conditions of learning and for securing the student's response.

HOW THE LEARNER LEARNS

Remember that the student must always do the learning. There are two ways in which he may learn: (1) through his own experiences and (2) through interpreting the experiences of others. There is much truth in the old saying "Experience is the best teacher." What a person gains through experience he remembers and uses; also, he interprets the experiences of others only through his own experiences. Out of this fact grows the old maxim of teaching: "Never do for a student what he should do for himself."

But life is too short for an individual to gain all his knowledge through first-hand experiences. For this reason schools are established in which the knowledge and skill acquired through the centuries by multitudes of individuals here and there — knowledge acquired often by accident, but sometimes by purpose through trial, experiment, and painstaking research — may be brought together and organized in such a manner that the student may acquire it in its most useful applications and with the least possible loss of time.

One of the fine points in teaching is to know just how much the student must discover for himself and how much he can get from the experience of others. In vocational or trade work one thing is certain; namely, that aside from *how* a student learns to do it, he must eventually acquire *all* the skills necessary to a successful practice of the trade, and it is the duty of the instructor to see that he does it.

The student learns

1. Through his own experiences
   a. By doing
2. Through interpreting the experiences of others
   a. By watching the performance of someone else
   b. By hearing someone else tell
   c. By reading
   d. By seeing pictures, diagrams, and charts

The good instructor keeps up the interest of the student by constantly reaching him through all these avenues and thus insuring his understanding of what is taught. Demonstration by the instructor is usually accompanied by some explanation, thus combining 2, *a* and *b*. A good written or oral explanation is usually accompanied by diagrams, charts, pictures, or the object itself. A blackboard drawing, diagram, or chart that is made as an explanation proceeds is a good combination of visual and auditory instruction. In the final analysis, however, the real fixation of the knowledge is through its use by the student.

LAWS OF LEARNING

Having defined teaching as purposeful effort to help a learner to learn, learning may be defined as acquiring the knowledge or skill by the learner through study or purposeful effort on his part.

The kind of learning with which we are concerned in organized instruction is thus distinguished from the incidental learning that comes from the everyday experiences of life. The success of the learner's effort is dependent upon, or subject to, certain principles that are now recognized as the laws of learning which may be stated as (1) the law of readiness, (2) the law of exercise, and (3) the law of effect.

In order to understand these laws we must first recognize that learning is a mental process, and we must get an idea of how the human mind operates. Every mental act is regarded as a response to an exciting cause called a *stimulus*. All physical acts, that is, muscular motions, are produced by nerve action originating in the brain. Therefore the muscular action is, in its final analysis, a mental action, and all skill in trade work, or, in fact, any physical act that a person performs, depends on action of the brain and its subordinate parts in the nervous system. Learning, that is, acquiring a new skill or fact, thus means that the learner renders a response different from any he has given before, and this new response must be excited by a new stimulus. This stimulus is involved in the new situation which the teacher deliberately sets up in his lesson organization.

The law of readiness means that when all mental conditions are favorable the desired response will readily be given. At times the response is more prompt and effective than at others. The delay is due to the fact that thought-channels, or thought-paths, in the brain are open by reason of the fact that the student's attention or interest is on something other than the new thing set up for him to learn, or because the chain of thought-centers necessary for the operation of the new impulse has not been properly connected up. The new response must come from a new thought-center which the thought-impulse must reach by traversing, as much as possible, old thought-channels with a minimum of resistance in finally leaping to the new thought-center.

This is illustrated in Fig. 1, in which the group of dots between *A* and *B* represents thought-centers which have been developed and between which thought-impulses have previously passed over paths represented by the lines connecting

the various dots. A new thought-impulse sent from *A* to *B* might follow any of the possible connections from center to center, but would naturally follow the best-developed path, as indicated by the heavy line. It will be noticed that this is not necessarily the most direct path, but it is the path most easily traveled (sometimes our thinking proceeds by very roundabout routes). It is desired to secure a response from

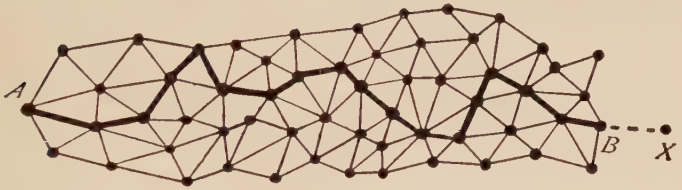

FIG. 1

thought-center *X* when the source of the thought-impulse (that is, the interest of the student) is at thought-center *A*. The nearest center to *X* is at *B*, but no path exists between the two. It is the teacher's task to start the thought-impulse from *A* to *B*, then lead it over to *X* on a new path. The passage over the route from *A* to *B* is easy because it has been traveled before, and the more often it is followed the easier it is to traverse again. The passage from *B* to *X* will be easier to traverse the second time than the first and still easier each succeeding time.

The law of exercise, then, means that the oftener and the more emphatically an impulse traverses a thought-channel, the easier the connection becomes and the more likely becomes a given response from a given situation. In other words, the oftener a person does a thing the easier it becomes. The deeper the thought-channel is worn the more likely is the impulse to travel through it rather than through

a different path, no matter how much shorter some other route may be. This is the reason why bad habits are so hard to break. It also shows the importance of getting the student to do a thing right the first time, for any act, right or wrong, leaves its trail, which future impulses may follow and wear deeper.

The law of effect means that when the response gives satisfaction the connection is strengthened between the situation and the resultant response ; or, in terms of our previous illustration, the tendency for the impulse to traverse the same channel is strengthened. Conversely, when the response is followed by annoyance a repetition of it is less likely from the same stimulus. The teacher should therefore see to it that every exercise that he prescribes for his student shall have involved in its effect or consequence something that shall mean satisfaction rather than annoyance.

The student may find satisfaction for his effort in the evidence of progress, in the approval of the instructor, in his superiority over the other fellow, in the success of the job, or in his enjoyment of the good workmanship he has achieved.

PROGRESS IN LEARNING

The greatest possible economy of effort should be exercised, both on the part of the instructor in imparting and on the part of the apprentice in acquiring knowledge. It is to be noted, however, that economy does not mean sacrificing accomplishment to save time or energy. The efficiency of the instructor is measured by the total effort necessary for the student to achieve the complete accomplishment of the course. Note that this achievement must be made by the student. The unskilled instructor is apt to substitute his own effort for that of the student, thereby deceiving both himself

and the student. The skilled instructor, then, is the one who knows how to *guide* and *direct* the activities (physical and mental) of his students in such a manner that they will attain the desired standard of achievement with a minimum expenditure of time and energy.

This is illustrated by Fig. 2, in which is shown graphically the progress of three different students in printing, represented, respectively, by lines A, B, and C. Let us assume that both start at the same time to learn to set type, all having zero skill; that is, knowing nothing about typesetting. Let the divisions along the bottom of the scale represent periods of time, say months, that have been spent in study and practice, and let the divisions on the vertical scale represent the number of ems of 10-point type that can be set in one hour. If conditions of learning are alike for each student, the progress of each would be identical and shown in the same line. But there are variations in the conditions, resulting in different curves or lines of progress for various students. At the end of the first month student A can set 150 ems per hour, student B 75 ems per hour, and student C 125 ems per hour. The interesting and important question now is, What causes this difference in the rate of learning? What are the variables entering into this situation? There may be two: (1) the students may have varying capacity for learning, or (2) the instruction methods may be different.

If the students are of equal ability, the variation must be due to difference in instruction methods. If the same instruction methods were used in each case, the varying rate of progress must be due to different capacity or to varying ability to learn on the part of the students. Now instructors who have not studied deeply into the underlying principles of their work are prone to ascribe altogether too readily

the difficulties of their students to the last-mentioned factor, whereas, in truth, the unsatisfactory progress of students is too often due to poor teaching-methods. If the three students were of the same ability but each with a different instructor, then the instructor of A would be twice as efficient

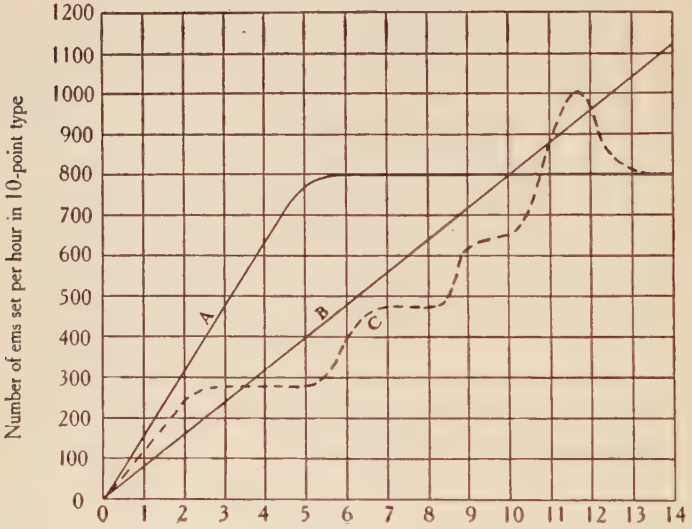

FIG. 2. Time units

as the instructor of B, because student A has made twice as much progress as student B in the same length of time.

Again, the rate of improvement in skill is not constant for any individual. Experiments in learning such arts as typewriting or telegraphy show that the learner usually makes a strong initial spurt; then his rate begins to slow up, and he reaches a stage where no increase in rate is achieved for a time; then he increases again until he reaches the next level of stationary progress; and so on. The line of progress

for student C illustrates this: at the end of the first period of time his rate of speed was 125 ems per hour; at the second period 250 ems; at the third period about 275 ems, which rate remained the same through the fourth and fifth periods; but in the sixth period an improvement is again shown, continuing through the seventh period, when he reaches about 475 ems per hour and continues at this speed until into the eighth period; then he goes through another period of improvement, and so on through successive rises and plateaus until he reaches the normal or standard journeyman rate of 800 ems per hour.

The meaning of these plateaus and whether or not they can be entirely done away with in any curve is a matter of dispute. These pauses may be necessary for some of the habits to reach a certain degree of perfection before further progress can be made. However this may be, there are several minor causes which tend to increase the number of plateaus and to lengthen the time spent in any one. In the first place, an insecure or an inaccurate foundation must result in an increase of plateaus. If at the beginning, during an initial spurt, for instance, the learner is allowed to go so fast that what he learns is not thoroughly learned, or if he is pushed at a pace that for him makes thoroughness impossible, plateaus must soon occur in his learning curve. In the second place, a fruitful cause of plateaus is loss of interest — monotony. If the learner is not interested, he will not put forth the energy necessary for continued improvement, and a time of no progress is the result. The attitude of the learner toward the work is extremely important, not only in the matter of interest but in the further attitude of self-confidence. Discouragement usually results in hindering progress, whereas confidence tends to increase it. The psychological explanation of this is very evident. Both lack of interest in learning and the presence of discouragement are likely to result in divided attention, and that, as has already been shown, results in unsatisfactory work.

A third cause for plateaus is physiological. Not only must the learner be in the right attitude toward the work, but he must feel physically "fit." There seem to be certain physiological rhythms that may disturb the learning process whose cause cannot be directly determined, but generally the feeling of unfitness can be traced to a simple cause, such as physical illness, loss of sleep, exercise, or food, or undue emotional strain.[1]

MAXIMUM EFFICIENCY

What determines the journeyman standard of 800 ems per hour for hand composition in 10-point type? This is the average rate at the present time, but a few years ago it was 1000 ems per hour. Many swift compositors have made from 1600 to 1800 ems, and a speed of 2100 ems is on record. Why has the former average been reduced? Can it be restored or even exceeded by the introduction of proper methods? Has the instructor in printing any duty or responsibility in this matter? Shall students be trained only up to the minimum speed accepted in the trade today, or shall they be overtrained? What is the maximum achievement to be expected of students?

The reduction in the former speed for hand composition is due to the use of machine composition, which now handles practically all the straight matter on which speed records could be made, leaving to the hand compositor only the irregular or special work. In this situation it is not to be expected that the old standard can be restored in trade practice; but it is true that the hand compositor today still has the capacity for the former record, for the introduction of the linotype or the monotype has not changed human nature. This statement answers some of our questions.

[1] Strayer and Norsworthy, How to Teach. Used by permission of The Macmillan Company, publishers.

The other questions, which are as applicable to every other branch of the printing trade as to hand composition, may be considered in accordance with the laws of learning. First, however, let it be recognized as a fundamental ethical principle in every line of human endeavor that upon every man rests the moral obligation to render to society his maximum of productive effort. Upon the instructor, therefore, rests the responsibility for bringing every student as near as possible to this maximum.

Returning to our illustration in Fig. 2, shall the student's rate of progress follow the line A, which shows a maximum rate of improvement up to the level recognized as the present journeyman standard, and then continue forever on this level? Shall it follow the line C in a succession of rises and plateaus to a point above the journeyman level, and then settle back to this level? Or shall it follow the line B, ever rising at a constant rate and with no maximum limit? The latter proposition would be ideal but impossible, for unquestionably there are limits to human capacity in any direction. The line C more nearly represents the actual situation, but is not true for all persons, for no two individuals have the same capacity.

The problem for the teacher is, first, to organize his instruction in such a manner that the line of progress for each student will be as constant as possible, eliminating the plateaus; and, second, to continue the improvement in skill to the very maximum of each student's ability. If the student later settles back to a lower level than he is capable of maintaining, it should be due to other causes than faulty instruction.

ORGANIZING SUBJECT MATTER

The analysis of the trade was worked out without reference to the student who is to learn the trade. It is not a course of study or a teaching-plan. To take this subject matter and adapt it to the learning-needs, ability, and capacity

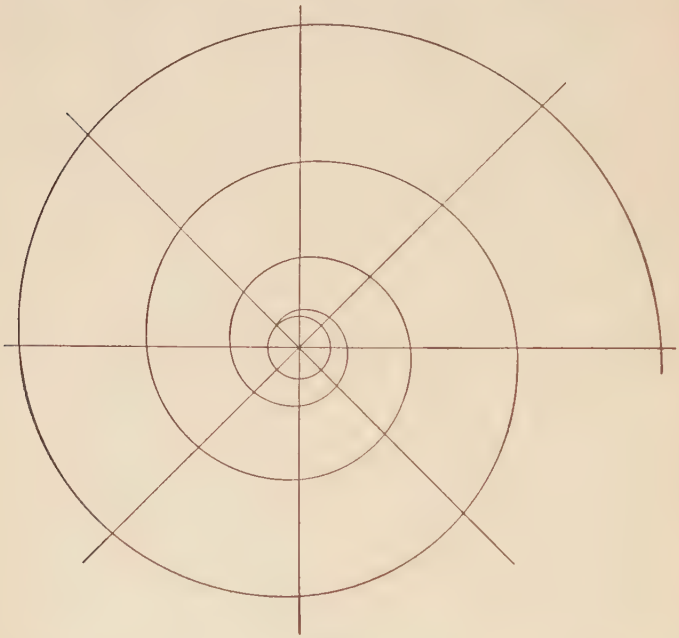

FIG. 3

of the student is another matter. The analysis of the trade is like the store with goods carefully assorted and arranged on the shelves. Putting up orders for customers is another aspect of the business. The instructor must now plan to "sell the goods"; that is, to arrange his subject matter to suit his students' needs for instruction.

In organizing instruction two methods are recognized: the unit method and the spiral method. In the unit method one topic is assigned, studied, and completely mastered before

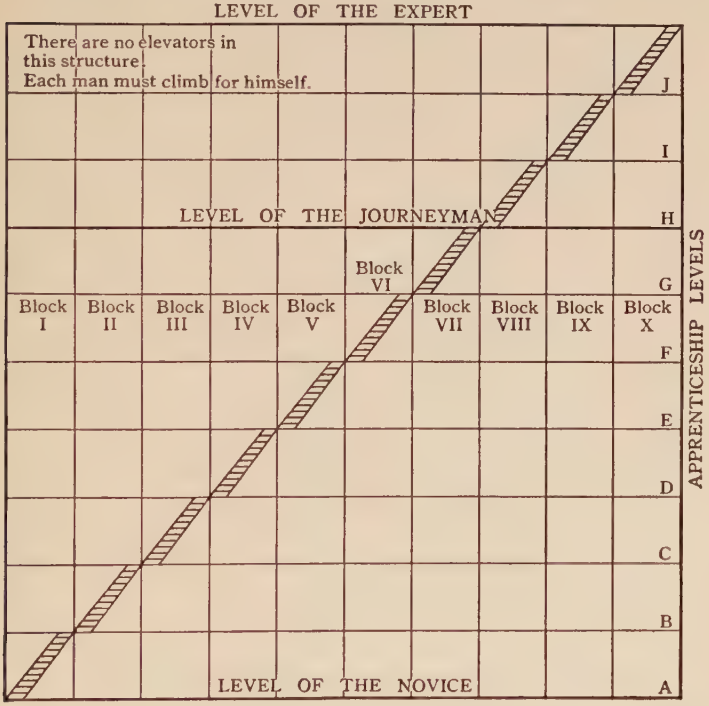

FIG. 4

another is begun. For example, an instructor might require his students to study, first, about all the material used in the trade; then about the tools; then about the science and the mathematics; and, finally, about the operations, before beginning any performance or practice work. By the spiral method a small portion of each topic is learned in order to complete

as soon as possible the learning-cycle through the practical performance; then another portion of each phase through another cycle; etc. The unit method is logical, but the spiral method is psychological. Very few things in life are learned by the unit method. Most of our learning is spiral, following an ever-enlarging curve and touching repeatedly upon various topics, but always at greater length or depth. The possibility of learning for any individual is infinite. This is shown in the illustration in Fig. 3. The straight lines represent units, starting from the center; the curve is a spiral. One cycle might represent a lesson. Each lesson is therefore a larger sweep than the preceding one, beginning where the last one left off and covering enlarged territory, even though it may touch on the same topics. This curve is the learning-path over which the instructor leads his student. It is not a fixed or arbitrary path, but is for the instructor to plot out. His skill lies in plotting it to suit the learner's needs and capacity.

Another method of illustrating the organization of subject matter is shown in Fig. 4, which represents the learning structure, to the successive levels of which the student must climb.

QUESTIONS

1. What is the difference between teaching and learning? between teaching and telling? between teaching and showing?

2. What two definitions of teaching are given in this chapter?

3. What determines the efficiency of teaching?

4. List as many as you can of the factors that enter into a teaching-situation.

5. Which should a student develop first, speed or accuracy? Why?

6. Why is it important to guard against the failure of a student in any first attempt?

7. Why is it important to set a high standard for the student at the outset?

8. Why is extreme care necessary in warning students against wrong ways of doing any job?

9. What determines the limit in the value of drill as a teaching factor? Explain by a concrete example.

REFERENCES

ALLEN. The Instructor, the Man, and the Job, chaps. xv, xvi.
COLVIN. The Learning Process.
STRAYER and NORSWORTHY. How to Teach, chap. iv.

LESSON II. INSTRUCTION DEVICES

The aim of this lesson is to consider some of the expedients or schemes which teachers, from many years of experience in helping students to learn, have found useful for the purpose.

To acquire skill in teaching, the instructor must know what method or combination of methods to use in a given situation in order to obtain the desired results; that is, as we have said before, in order to help the student acquire the desired knowledge or skill with the least expenditure of time and energy. The most common devices or "tools" of the teaching-trade are

1. The Oral Recitation
2. The Written Recitation
3. The Lecture
4. Questioning
5. The Demonstration
6. The Illustration
7. The Experiment
8. Practice in the Job
9. The Examination

We shall now discuss the use of these devices and try to explain some of the "tricks" of the trade of teaching. Before taking up these methods separately, it may be stated as a general principle that the teaching-method chosen in any case must be determined with reference to a few fundamental conditions, such as age and qualification of the students, subject matter, aim of the lesson, and the teaching-conditions.

1. THE ORAL RECITATION

In educational institutions the usual plan of instruction is for the students to be assembled at stated periods in a classroom over which the instructor presides and directs the instruction in accordance with the various methods which we are discussing. In ordinary schoolroom practice one of the most common methods of procedure during this class period is for the instructor to call on various students to "recite"; that is, to repeat from memory or otherwise the facts or principles that they have acquired from previously assigned study. When the recitation of the lesson assignment has been covered, a new assignment is made and the class dismissed, to return at the next stated time. For instruction in the related subjects much use can be made of this method of procedure, but for the actual shop-work instruction the plan must be considerably modified, and the recitation period must partake of a character quite different from that of a quiz. Since apprentices are older than elementary-school pupils and have specific interests and purposes, they may be instructed more profitably by other methods. There is, however, much advantage in assembling the group of students at stated periods so that certain information directly related to their trade performance can be presented in an orderly and systematic manner.

For the benefit of the shop-teacher who has not had pedagogical training some suggestions are here offered for the conduct of this class period.

1. The class should assemble punctually. Do not tolerate straggling by any students. The example and attitude of the instructor himself will largely control this matter. If he is punctual, methodical, and masterful, he will receive a like response from his students. An effective device for securing punctuality is to call the roll promptly on the minute for the class to begin. This should be done whether the class is assembling for a shop-work period or for a recitation period.

2. The classroom period should not be too long; one hour should be the maximum. Half-hour periods thoroughly prepared and skillfully conducted are better than one-hour periods of easy-going dawdling. The trade-teacher usually has to take his recitation period out of shop-work time, and he should remember that his students need a maximum of practice and performance and a minimum of talk and theory.

3. The class should be properly seated. Where the shop is in charge of only one teacher, the recitation seats may be in a section of the shop. This gives the advantage of having the equipment and materials readily accessible for illustration and demonstration. Where several instructors work in one shop, it is better to have a classroom separated from but adjacent to the shop so that the recitation periods of any one class may be held without annoyance from others. For shop-work classes chairs and tables or tablet-arm chairs are preferable to the schoolroom type of desk. Occasionally it is desirable to call the class together around some machine to explain some special feature. In this case students cannot be seated, but perfect order should be insisted upon.

4. A reaction from students should be secured. During this class period the instructor will present his subject matter in the form of lecture, demonstration, illustration, etc., as will be discussed later, but he should give opportunity for students to respond by asking questions or engaging in discussion. The success of the teacher's presentation is oftentimes shown by the discussion which it provokes. The instructor should, however, always be master of the situation, holding the discussion strictly to the point and not allowing it to become sidetracked or upset by frivolous conduct on the part of any students. A discussion is likely to be of more value with a class of older or advanced students than with beginners.

2. THE WRITTEN RECITATION

In the strict schoolroom sense of the term a written recitation means giving the class a set of questions relative to the lesson assignment and requiring each student to write out the answers to all the questions. This, of course, gets a reaction from and tests out all the students at the same time.

With similar purpose some trade-instructors, in an effort to compel all students to do certain study or research, use the device of issuing sets of questions which students are to answer in written form. The writing of these answers is usually done as home work; that is, outside of class hours.

The advantages of this method over the oral quiz are (1) it permits more thorough answering of questions; (2) it requires each student to do the work; (3) it compels independent work (copying or collusion should be discouraged); (4) it acquaints students with sources of original information in the references consulted; (5) answers can be more carefully examined and criticized by the instructor. It has the disadvantages, first, of requiring considerable time and effort

by both students and instructor (and the value of this time should be carefully considered); and, second, of being a bugbear to certain students who have little aptitude for written expression, although they may be very loquacious orally or excellent in the manual performance of their course.

This method is more justifiable when the written answers to the questions are preserved in an orderly manner in a notebook to which the student can make frequent future reference. At the close of each lesson some questions may be given for this purpose. The instructor should see to it that the student faithfully performs this part of the work. Answers should be neatly written in ink. The loose-leaf type of notebook is of advantage because it permits the writing and handing in at the completion of the unit of a single set of answers requiring but a few sheets, and the instructor does not have to handle the whole book each time. The habit of recording in the notebook information or data that will be valuable for future reference is one that every instructor should encourage on the part of his students.

3. THE LECTURE

As used in this discussion the term *lecture* means imparting information by one person to another person or group of persons by means of the spoken word, whether in an informal talk or on the more formal occasion where the speaker addresses a large audience.

This old and much-criticized method of instruction contains both advantages and disadvantages for the teacher of trade subjects. It is often the only means of presenting certain information that is not available to students in any other way, as in the case of the specialist who has made research and experiments in connection with paper or ink manufacture, or

of the expert sent out by the manufacturer of some special machine to impart information that is not yet in print.

Even if the subject matter is to be found in books, it is often a saving of the students' time to have it organized and delivered to them by some one person in a few minutes, rather than to require all members of the group to study it individually, thus multiplying the total time devoted to the subject. The personal inspiration of the speaker and his ability to vary his language and inflections give to the lecture the possibilities of explanation, illustration, or emotional appeals to suit the needs and response of the hearers, which is not possible with the fixed, printed page.

The objections to the lecture method are (1) that the hearer is merely a recipient, gaining his information too easily to be appreciated; (2) that the instructor has no means of testing his hearers to determine whether they have mastered and can apply his talk; and (3) that the method lacks interest on the part of the students. The force of these objections lies in the abuse rather than in the legitimate use of the lecture. The following precepts are offered to help instructors to avoid the misuse and secure the advantages of this teaching-method.

1. Lecturing should not be overdone; in other words, the teacher should not talk too much. The lecture, instead of constituting the primary method of instruction, should be used to supplement other forms of instruction. For teaching shop-work subjects it should be reduced to a minimum and should be conducted with the utmost discretion. It is oftentimes better to call the class together around a machine or a live job under way, to explain some particular phase of the work as it arises, than to try to incorporate this information in a formal lecture given at some fixed time and place more remote.

2. Lecturing should be adapted to the character of the students. For advanced apprentices or journeymen taking extension courses in evening classes — that is, for men who have considerable foundation in trade experience — some of the finer points of the trade may be brought out by a speaker and comprehended by the hearers without very much accompanying shop practice. Beginners, however, require more performance for themselves and less talking by the teacher.

3. A lecture should be carefully prepared in advance, with the outline clearly and distinctly formulated so that the natural sequence of thought can be readily grasped by the hearers. Often it is advantageous to give to the class in advance an outline of the talk to be given. This may be written out on the blackboard, presented in printed or mimeographed sheets, or dictated for the class to write in notebooks. This plan is of particular value when a series of talks is given, both as an incentive to the instructor to make thorough preparation of his talks and stick to his subject, and as a means of helping students to get the whole series in complete and logical form for study and future reference.

In outlining a lecture do not use too many main divisions; three or four are usually enough for any one session. A lecture introduced by a statement that it proposes to present or discuss the topic under three or four certain points is more likely, because of its definiteness and sequence of thought, to get the attention of the hearers than one that rambles on without the plan being apparent. The subdivisions of each main point should also be clearly developed and presented.

The beginner at the trade of teaching is urged to make very careful preparation of his talks. He should by all means avoid the loose, wandering, digressive, repetitive discourse that comes from poor preparation, that does not secure the

interest of the hearers, and that really means loss of their time in listening to his circumlocution.

4. A lecture should not last too long. Usually fifteen minutes is long enough for an instructor to talk continuously. Thirty minutes should be the maximum. There are very few situations, in school or out, where an address of more than thirty minutes is justified.

5. A lecture should lead to action. This may be in the performance on the job which the talk has explained, in discussion or questions by students, or in further study of topics in which interest has been aroused by the lecture. The instructor should always encourage a discussion by his students as a means of testing whether he has succeeded in the purpose of his talk. The lecture belongs to the presentation phase of the lesson which, as we shall see later, is only one step in the whole lesson procedure, and therefore only a part of the teaching-process. The teacher's responsibility does not end when he has merely told the student something.

6. The lecture should be used only when it is more profitable than any other method on the basis of economy in learning; that is, it should be deliberately chosen as the method of presentation because it will enable the student to acquire the information content of any given lesson in less time or with greater thoroughness and effectiveness than by any other method. Too often it is indiscriminately used by the instructor because it is for him the line of least effort rather than the best method for helping his students to learn.

4. QUESTIONING

The question is one of the teacher's most important tools. It is a simple means of setting before the student a situation that will bring a desired response. By means of questions,

the one who knows may skillfully lead the student to discover things for himself through mental processes of analysis, comparison, association, and selection of ideas. Good questioning, then, is a large factor in good teaching, and skilled instructors use this device more frequently than any other. Because it is easier to tell than to develop an idea through questioning, the untrained or the lazy instructor usually abuses the lecture method by doing too much telling and not enough questioning.

The purposes of questioning are

1. To reveal the student's mind to himself: to get him to realize what he knows and what he does not know.

2. To reveal the student's mind to the instructor: to find out what the student knows and what he does not know.

3. To guide the student in the discovery of new facts and in the acquisition of knowledge.

The kinds of questions classified according to purpose are as follows:

1. *Drill questions* are used when it is desired to test the student's mastery of facts. This type of question depends on memory only and is the kind employed in set lists of questions and answers (catechism), which is not as much used by good teachers now as formerly. In many trade subjects there are relatively few fixed facts that need to be established in memory by sheer repetition and tested by drill questions. The informational part of the trade can better be acquired by processes of reasoning and association of ideas. Therefore the drill question is of minor value to the trade-teacher.

2. *Development questions* are employed to lead the student to the discovery of a new fact or principle. Having in mind the thing that he wishes to bring out, the instructor, by

a question connecting something familiar in the student's experience, brings up some other fact that the student already knows; then by a series of questions leads from this known fact through related known facts to the new principle that he wishes the student to acquire. The response to the questions presented may involve recall of ideas, comparison of ideas or facts, analysis of ideas or concepts, selection of alternative ideas, or organization of ideas into new concepts.

3. *Examination* or *review questions* are used to test the present knowledge of the student and to recall past instruction; also to assist him in organizing and classifying his knowledge. This phase of questioning will be discussed later in connection with examinations.

4. *Secondary questions* are usually asked for the purpose of giving the student a chance at self-expression. They usually require a descriptive answer and have no measure of right or wrong, since they call for the student's opinion. In this class may also be placed the questions that propose big problems to be solved and that stimulate to further research; questions the response to which evokes further questions or investigation into new fields of knowledge based upon an appeal to the scientific imagination.

Hints on questioning. There are a few suggestions that beginners in teaching may well heed in the matter of questioning.

1. The questioner should be sympathetic. Encourage the student; do not make him feel that he is in the witness box with the opposition lawyer putting him through a cross examination for the purpose of tripping him.

2. In group instruction state the question before calling the name of the individual who is to answer. The whole class should be ready with the answer.

3. Vary the order of calling on individuals. Do not go around the group in any given order that will enable anyone to anticipate just when he is to be "called on."

4. Do not repeat questions or answers unless for some good reason. All should be paying attention or take the consequences.

5. Give time to think between stating the question and calling for an answer.

6. Make the questions clear and concise.

7. Use good English in asking questions.

8. Do not ask questions that may be answered by "yes" or "no." There is always an even chance that the answer will be right whether or not the student knows anything about the question. Such questions do not stimulate thought.

9. Require answers to be stated in complete sentences. Do not accept single-word answers. By requiring complete statements valuable training is secured in the use of good English, especially with younger students.

10. The question should not give a "hint" at the answer. Such questions are a detriment to *thinking*.

11. The question should not involve too much in its scope or content. Avoid the double, or compound, question.

Good questions stimulate thought on the part of students; they bring a prompt and definite response and accomplish this result with a minimum expenditure of time. The instructor should therefore prepare in advance the main questions which are to be used in the lesson. The analytical mind makes a good questioner, and an analysis of the lesson to be taught helps any instructor to become a good questioner. Eternal vigilance is the price of success. The ambitious instructor will be self-critical and improve by correcting his own mistakes from day to day.

5. THE DEMONSTRATION

In teaching another person to perform any act of skill, a most natural method is for the instructor himself to perform the act in the presence of the student. In shop work there are many skills that can be taught more readily in this manner than in any other. A few principles or maxims relative to the use of this method are here offered for the guidance of inexperienced teachers.

1. A demonstration should always be performed with real tools and materials and under actual working conditions as far as possible.

2. The materials and conditions should be prepared in advance, as well as the outline of the procedure. Students should not be kept standing around while the teacher is getting ready, nor be required to witness and listen to an exhibition that has not been carefully thought out. They will respect their instructor in proportion to his thoroughness.

3. Before beginning, be sure that all students can see every motion and detail. Let nothing be concealed. Consider both the arrangement of your materials and the position of students.

4. In beginning, state definitely what you intend to do or show. This sets in the minds of your students an objective which helps to hold their attention.

5. Carefully analyze your own motions and explain each operation as the demonstration proceeds. Skillful use of questions will help students to reason out and anticipate certain operations, thus keeping their interest keyed up.

6. The performance by the instructor should be followed by ample practice by the student. The latter may observe and may think he understands, but he must actually do the work himself to master it.

7. Do not do the student's work for him by demonstrating on his tools or materials to the extent of depriving him of adequate practice. After you show him how to perform any operation, let him do it after you, as independently as possible. Wherever possible let your demonstration be on other stock or material than that which he is using.

8. Remember that the purpose of the demonstration is to help the student to learn, not merely to exhibit your superiority or cleverness. But remember also that he is to imitate you, and that he is not likely to develop a standard of workmanship higher than you set for him. Put your best effort into every demonstration that you perform, so that your students may recognize and respect your skill, but do it all in a spirit of aiding them to acquire the master touch of craftsmanship.

6. THE ILLUSTRATION

Closely akin to the demonstration is the illustration as a teaching-device. The chief difference between the two is that the demonstration deals with *actual* tools, materials, and working conditions, while the illustration uses things that are *similar* to the real thing. For the illustrative method to be successful the student must already have had experience with some of the elements of the subject under discussion so that from this experience he can make the mental pictures suggested by the illustration.

This method can be used where demonstration is impossible. An instructor may take a class into a room away from the noise and confusion of the shop and, by using pictures, models, diagrams, or exhibits of various materials, bring out many interesting and valuable points related to the work under way. Examples of this are specimens showing the

evolution or manufacture of machines, and materials taken from different stages of production. Very valuable for explaining the operation of intricate machines, such as the linotype or the apron mechanism of an engine lathe, is the practice of having different sections of these machines mounted on stands or boards in such a manner as to disclose working parts that are concealed in the machine when in operation. Wall charts or printed cuts are also useful for this purpose.

The danger in the use of illustrative materials lies in the fact that it is often easier to illustrate than to demonstrate, and the instructor who has a tendency to minimum effort is therefore more likely to use the illustrative method. Remember that for securing actual performance from the student, the demonstration is always preferable. Illustration should be used as a supplement, for explaining intricate or involved parts or operations, but not as a substitute for demonstration.

7. THE EXPERIMENT

As a teaching-device for developing in students an attitude of independent investigation or research through systematic and orderly procedure, the experiment possesses possibilities that have not yet been realized by shop instructors. For example, it may be utilized to advantage in many phases of printing, such as studying effects of colors, using various kinds of ink and papers, spacing and arranging type mass, etc. In every trade there are similiar opportunities.

An experiment may be performed by the instructor in the presence of the class, but students should also have opportunity to try out a number of experiments in order to establish scientific methods of procedure and to remove any inclination toward guesswork.

The general purpose of an experiment is to seek to discover some fact or result by making a series of trials in a situation in which all conditions and factors are under control, with one factor which is definitely varied in each trial and to which the varying results of the trials may be definitely ascribed. A few suggestions concerning the conduct of the experiment are here offered :

1. An experiment should always have a definite purpose or aim. It should seek to solve some specific problem or to discover the conditions which will produce a desired result. For example, what hue or tint in ink color will give the most satisfactory results with a given type form and sample of paper stock ? This may be determined by a series of careful trials.

2. All conditions and factors necessary for the investigation should be selected, and the constants and variables identified. By constants are meant those conditions and factors which are the same in every trial ; variables are the conditions or factors in which there is change in the different trials. The most conclusive results are obtained when there is but one variable. In the example mentioned in the preceding paragraph we should set up as constant conditions a given type form, a given sample of paper with enough sheets to provide one for each trial, and a given kind of ink to serve as a base. The variable would be the other color of ink to be mixed with the base ink.

3. The procedure must be methodical and orderly. The series of trials should represent carefully graded modifications in the variable from least to greatest, or vice versa ; that is, the experiment should cover the whole range of possible variations within the limits set up. In our example we will take the first proof on our selected paper, using only the base

ink. A given quantity of this ink by measure is to be used in each trial, but into this quantity is to be mixed for each trial a definitely increased quantity of the secondary color.

4. A record should be made of each trial, giving the degree of the variable and the results. In our example this record consists of the proof pulled from each trial. On it should be written the number of the trial and the quantities of the ink mixture.

5. The results of the different trials should be carefully studied and the set of conditions giving the most satisfactory results should be selected. Any result or effect can be accurately reproduced without guesswork by referring to the record of the trial giving the desired effect. In our example the same mixture of ink can be made because the record tells its exact proportions.

Partaking somewhat of the nature of the experiment is the teaching-device, frequently used, of having students collect specimens or samples of various kinds. To be of the utmost experimental value such collection should include as wide a range as possible of specimens of the kind that is being studied. To study only one or two may be of some value as illustration, but students should be taught to be thorough in their study, not limiting their observations to, or drawing conclusions from, a narrow or superficial range of examples or trials.

After collecting the specimens the student should examine each one, compare each with the others, and classify and arrange them in order. He should then evaluate each specimen by determining its relative and specific worth; that is, he should decide for what uses each is best adapted and give the reasons therefor. This general procedure — collecting, examining, comparing, classifying, and evaluating — will help

students to acquire orderly methods of study and enable them to do much original and independent research in various phases of their work as mechanics.

Modern industry in all its branches offers unlimited opportunity for investigation and research. New methods and devices are constantly being introduced, and each one opens up a still larger field for further study. The discovery of better ways of doing things or the development of new principles and processes can no longer be trusted to luck or accident. We have passed the age when "trial and error" was the chief method of learning. The new scientific age deliberately seeks out the *best methods* by trying out systematically all possible methods under all possible conditions. This point of view instilled into the minds of our apprentices will develop a generation of skilled craftsmen who are able to select wisely the most efficient ways of doing their work, or who can profitably adapt themselves to the new conditions which this progressive industrial age is imposing with ever-increasing frequency.

8. PRACTICE ON THE JOB

Mere telling or showing will not enable a student to perform an act of skill. With all the lecturing, demonstrating, reciting, or studying, the student must finally "learn to do by doing." Certain subtle, muscular coördinations can be established only by actual practice. No system of instruction has yet been devised or is conceivable from our present understanding of the process of learning which will enable the apprentice to acquire the requisite skill in any other way. The methods of instruction previously discussed are useful in aiding and facilitating the learning of the informational content of the trade, but are not substitutes for real performance

under actual trade conditions. Therefore the way to teach a youth to do the work of a mechanic is to place him in the shop with access to actual tools and materials and let him proceed to perform the work of the mechanic. In this situation skill in teaching consists in analyzing the work into its simple elements or operations, in arranging these operations in a progressive scale according to difficulty in learning, and in setting the apprentice to mastering them one by one. The selecting, arranging, and assigning of these operations, and the testing of the student's proficiency in their performance, constitute the major part of the work of the teacher of shop work. We will briefly summarize here a few pertinent points on the use of practice as an instruction device.

1. Practice should be performed under actual trade conditions. In the trade work taught in schools this is entirely feasible, for every item in standard equipment may easily be introduced into the school shop.

It is essential that the beginner at any trade should learn to use standard tools; he should not acquire his first lesson working with makeshift, "amateur" appliances and inferior material, or by inept, unworkmanlike methods. Yet it does not necessarily follow that the newest idea in material or the latest improvement in a machine offer any superior advantage over an older, generally accepted material or machine. In any case, study and practice with an "improvement" may be a serious limitation if one does not go farther back to fundamental principles. All peculiarities or eccentricities in equipment should be avoided. A vocational school is no place to try expensive experiments or to introduce innovations.

While adequate equipment is necessary, avoid excessive equipment. Do not let the criticism of "over-equipped and under-taught" apply to your shop.

2. Practice should be provided in essential and fundamental operations. The first concern should be that the apprentice should understand and master sound rudiments of the trade, and then that his instruction should be such as to enable him gradually to develop in his work any reforms and improvements which might prove of real advantage. Sound instruction should be stripped as much as possible of superfluities in order that the essential elements may be clearly seen and understood.

3. The student should be thoroughly prepared for his practice; in other words, the particular skill that he is to practice should be properly presented to him by demonstration or otherwise, all details and motions explained, and all necessary related information given, so that he will have a minimum of difficulty in performing it.

The converse of this principle is that students should not be permitted to undertake work for which they have not been properly prepared. In every class there are likely to be found one or more venturesome boys who will undertake tasks far in advance of their ability. The instructor must be constantly alert to forestall any such attempts. He must at the same time avoid repressing ambition and initiative, which traits are to be encouraged.

4. Practice should be continued up to the point of maximum efficiency. See the discussion of this point in connection with laws of learning on pages 52 and 53.

9. THE EXAMINATION

The reliable printer, before delivering a job to a customer, will carefully inspect it to make sure that it contains no error in composition, no spoiled sheets, that the count is correct, and that it is satisfactory in every respect. The inspecting

and checking-up process is just as important for the teacher of trade work as for the job printer. It is necessary to make sure that the student can perform all the skills of the trade and that he can do all jobs according to trade standards of workmanship. The means of checking up the student's proficiency is, in school practice, called the examination.

The purpose of the examination may be threefold: First, it determines the student's proficiency as a basis of promotion. When he shows by test that he can satisfactorily perform the work of the lesson or group of lessons, he is ready for the work of the next division. The examination given for this purpose is sometimes called a final examination.

Second, the test reveals weak points, the things that the student has not yet mastered and to which further study and practice should be given. Skilled instructors will give such tests at frequent intervals in order that a student's deficiencies may be discovered and corrected, thus assuring a substantial foundation for the work of subsequent units. This is like proofreading, getting press O. K., etc. at various points in the progress of the job, instead of going through the whole thing to the end, then discovering errors in composition, make-up, etc. which require doing most of the job over.

A third purpose of the examination is to discover the cause of failure, whether it be due to lack of capacity or ability in the student or to improper teaching-conditions or methods. It is important that the reason for failure be conclusively ascertained and corrected as far as it is within the power of the instructor to do so. This purpose of the examination is distinct from and even more serious than the second purpose, of detecting occasional weak points in the student. It is as necessary to check up and correct the teaching-conditions occasionally as it is to test out the student.

Three kinds of examinations may be used. For testing the informational or technical phases of the work, the oral examination or quiz may be employed. This is feasible as a time-saver where only one or two students are to be examined at a time. The written examination may be used with a large class as well as with a single individual. It is less personal and more thorough by permitting the student to write out the answers to the questions as completely as possible.

The kinds of questions used in written examinations deserve some consideration here. In the first place the character of the questions should be determined by the purpose of the examination, and the content of the answers sought should be within the subject matter which the student has covered. It is obviously unfair to expect a student to answer concerning something that he has not studied.

There are certain types of undesirable questions. Avoid double questions, also questions that may be answered by "yes" or "no." Trick, or catch, questions are unfair and will not be employed by a considerate teacher. Avoid also the guess question to which there are but two possible answers, such as right or left, up or down, front or back, etc., so that a student stands an even chance of answering correctly by guessing or bluffing. Likewise undesirable is the question that permits of too great a variety of answers.

Questions should be specific, capable of being answered definitely and briefly without long explanatory answers. The rating of the answers is to be taken into consideration in making up the examination, and questions should be so formulated that the answer can be evaluated readily and justly. Sometimes a set of questions has definite values assigned for each, the total making one hundred points, thus placing the rating for the whole examination on a percentage basis.

For a test to discover deficiencies requiring special attention, it is desirable to ask questions touching on as wide a range of points within the unit as possible; but for a final examination thoroughness in a few points in an answer paper may be taken to mean that the student is equally competent in all topics of the unit. Therefore a few questions representing scattered phases of the subject may be given.

One objection to the written examination is that students may pass it by intensive study, or "cramming," just preceding it. The answer to this objection is that the intensity thus exercised is a valuable exercise for the student, and in the heat of the process many facts are fused into his intelligence that he would not otherwise have mastered. The dread of students of the ordeal of the examination is another objection, but it should be remembered that the written examination is still the method largely used in the civil service and in many other places for testing the intellectual fitness of an applicant for preferment or promotion. Judiciously administered, there is still some justification, even in trade work, for written examinations.

The third kind of examination and the kind for which there is the most legitimate use in shop subjects, is the performance test. The great question that the world asks of every man is not How much do you know? but What can you do? Therefore the trade school should send out students with definite and proved ability to do certain kinds of work required in modern industry. Performance tests are intended to be fair samples of what the student should do at the various stages of his work and as a result of the instruction provided. Students should understand that such a test is an inevitable close of each unit, and realization of this fact is calculated to spur them to greater diligence in the work of the unit.

QUESTIONS

1. What are the abstract facts in your trade that depend on sheer memory for recall?

2. Which of the teaching methods represent activity by the instructor and which activity by the student?

3. What are some tendencies that a teacher should guard against?

4. What are the objections to the lecture method in teaching industrial work?

5. List some experiments in your trade that might prove profitable to your students as a means of learning.

6. Why should a teacher ask some questions that may not be answered immediately?

7. Why is it important to phrase questions carefully?

REFERENCES

ALLEN. The Instructor, the Man, and the Job, chaps. xxiii–xxvi.
STRAYER and NORSWORTHY. How to Teach.

LESSON III. THE TEACHING-UNIT — THE LESSON

The aim of this lesson is to explain the character of a lesson and to show how it is organized into definite stages.

In the lesson on the teaching-process we represented the learning structure as a succession of levels of achievement in learning which required the student, in his ascent from the level of the novice to that of the journeyman or expert, to climb round by round or step by step, each step representing a lesson.

WHAT IS A LESSON?

The common notion is that a lesson is the same as a class session. This would be an ideal situation, but in most phases of shop-work instruction it is not true. The definite

instruction units cannot be made to coincide with constant or uniform time units. Some lessons may be learned in a few minutes; others may require many hours, running over several class sessions. The young teacher must dispossess his mind of the idea that a lesson and a session are identical. The lesson is a basic working-unit of learning, containing the new element to be learned, the definite step assigned to the student which he is able to take successfully.

CHARACTERISTICS OF A LESSON

Every lesson has three distinct characteristics. First, it has an *aim* or *objective*, a definite point which the student is to reach, which must be within his capacity to attain in a single step from the point or level that he has already reached. Usually this aim is implied in the lesson title, such as "Cutting a V-Thread" or "Splicing a Ten-Strand Cable." Sometimes the aim is set forth in an introductory sentence or paragraph, as is done in the lessons of the unit you are now studying. The statement of this aim is an advantage to both the instructor and the student, since it makes for definiteness and precludes diversion of effort or dissipation of energy. Unless the aim is specifically formulated and made clear to the student, no lesson should be conducted.

The second characteristic of a lesson is its *content* or *subject matter*. In a carefully outlined lesson the divisions of the subject matter will represent the teaching-points. For example, a lesson in the engine-lathe unit of a machinists' course might have as the title, "Cutting a V-Thread." The content or teaching-points might be stated thus:

1. The use of threads in machine construction.

2. Threads are cut on cylindrical pieces which the student has already learned to make.

3. The different shapes of threads: V, square, Acme, etc.
4. The shape of the thread-cutting tool.
5. The pitch of a thread.
6. Computing and setting the gears.
7. Making the roughing-out cuts.
8. Making the finishing cuts.
9. Testing with the thread gauge.

The aim and the teaching-points must be specific and definite, reasonable in scope, and suited to the experience and intelligence of the student. These teaching-points measure the rise of the student from one round to the next in the instruction ladder just as a vertical distance is measured in inches or feet; they represent the complete ascent of the student from his instruction level at the beginning of the lesson to the level predetermined in the aim of the lesson.

The third characteristic of a lesson is its *procedure*, or the distinct stages which comprise it. Before considering this matter, however, let us notice some other features of the lesson.

KINDS OF LESSONS

Before planning out a lesson the instructor must be able to classify it with reference to (1) *type*, whether elementary or derived; (2) *character*, whether production or technical; (3) *line of approach*, whether informational or developmental; (4) *teaching-conditions*, whether shop, laboratory, or classroom; (5) *size of the class*, whether single student, few students, or many students.

An *elementary lesson* is one that requires no other lesson in the series as a prerequisite, while a *derived lesson* is one based upon other lessons preceding. For example, a student in a machinists' course might start in on the lathe, the drill press,

the planer, or the shaper. None of these depends upon preceding instruction or skill. The first lesson in either group is an elementary lesson. But the student must know how to turn plain cylindrical forms before he can learn to cut a thread. Therefore a lesson in thread-cutting is a derived lesson.

A *production lesson* is one in which the student or apprentice works on stock and performs operations entering into a real, usable product, while a *technical lesson* has no reference to the final disposition of the material. If a student learns to install electric bells by working on an actual installation job, it is for him a production lesson; but if he assembles the bells and connections on a wiring board from which they are stripped off at the close of the lesson, it is a technical lesson. He *learns* to hang bells in either case.

When the subject matter is given by dictation, as in a lecture or printed text, the line of approach is *informational*. The student merely receives it. But when he is led by skillful questioning or suggestions to reason out the procedure of the lesson step by step for himself, the line of approach is *developmental*. The informational approach doubtless saves time in many cases, but the developmental method is better calculated to train students to solve problems.

STAGES OF THE LESSON

The science of pedagogy recognizes several distinct steps or stages in a complete lesson, some authorities listing as many as six or seven, others comprehending the process in three. The four steps of a lesson most generally agreed upon are (1) *preparation*, or getting the learner's mind ready to grasp easily the new idea; (2) *presentation*, or introducing the new idea successfully to the mind of the learner; (3) *application*, or fixing the idea in the learner's mind by his use of

Lesson Phase	Attitude of Learner	Teaching-Steps
What the learner already knows		
Matter recalled from his experience or previous instruction, directly related to the lesson and from which the new lesson must start	Responsive	1. *Preparation* by (*a*) suggestive questions (*b*) suggestive experience (*c*) suggestive demonstration (*d*) suggestive illustration
The new matter contained in the lesson	Receptive	2. *Presentation* by (*a*) demonstration (*b*) illustration (*c*) lecture (*d*) experiment
Proficiency to be acquired by learner through his own effort. This should comprise the greater part of the time in a lesson in shop work	Active	3. *Application* by (*a*) practice on the job (*b*) recitation (*c*) discussion (*d*) written recitation (*e*) examination (*f*) research
Checking up by instructor	Passive	4. *Testing* by (*a*) inspection (*b*) examination
Learner applies principles of lesson to other situations	Active	5. *Generalization* by questions or references for further study

Fig. 5. The Lesson

it; (4) *verification*, or testing the learner's proficiency to ascertain to what extent he has mastered the new idea. Frequently a fifth stage is also given, called *generalization*, or getting the learner to apply the new idea in other situations.

These stages are not separate in the sense that one distinctly ends where another begins; they may and usually do overlap considerably. The instructor should, however, be able to identify any item or element in the lesson as belonging to some one of these stages. This will make for purposeful and well-ordered procedure in conducting the lesson.

Step 1. Preparation

In our discussion of the process of learning in Lesson I of this unit we saw that learning a new fact means that a new thought-center in the brain is stimulated, and that this can occur only if the thought-impulse reaches the new center by traversing as near to it as possible over thought-tracts previously traveled, with a minimum distance to go finally over an entirely new path (refer again to Fig. 1, p. 47). Therefore any new thing learned must be approached through experience or knowledge that has already become a part of the mental equipment of the learner.

The faculty of interpreting new experiences in terms of former experiences and mental concepts is called apperception. The elements taken from the background of experience to be used as the foundation or point of departure for the new lesson constitute the apperceptive basis of the lesson. It should be noted that former lessons have become a part of the student's experience and may constitute this apperceptive basis, as well as the general experiences of life.

The preparation step of the lesson, then, is recalling to the mind of the learner such of his knowledge and experience as may be related to the new thing to be taught. It is a focusing of what he already knows in a manner that will help him to understand the new ideas about to be presented.

As the thought-impulse travels from center to center in the brain, so the lesson theme progresses from point to point, from topic to topic. Each point may be a preparation for the next point, or a group of points may be preparatory to some later point. There must be laid in the mind of the learner an adequate foundation, not only for the lesson as a whole but for each point in the lesson. For an elementary lesson the preparatory foundation must be taken out of the student's general experience.

As the character or purpose of this stage of the lesson is to recall to the student's mind some of his previous experience or knowledge, the methods or teaching devices used for the step must be chosen accordingly. For recalling ideas, suggestion in some form is the natural principle of action. This may be accomplished through suggestive questions, suggestive illustration, or suggestive demonstration.

The question-and-answer, or developmental, method is valuable in this step with classes of younger children in academic subjects, but it may be greatly overdone with more mature students, like apprentices, who possess such distinct interests and motives. While the preparation should be thorough in order to be effective, it does not mean that it should be too long or rambling. For the kind of lessons and students that we are considering, a few pointed questions or brief sentences will usually be sufficient at this stage.

Step 2. Presentation

With the student's attention directed from the realm of his previous knowledge and interest to the specific new fact or skill which he is to acquire, the facts, principles, and performance of the lesson may now be presented. In this presentation the instructor should leave no means untried for getting

the student to understand thoroughly all the "whys" as well as the "hows" of the lesson. If the student understands the reasons for the various operations that he performs, he will execute the work more efficiently than if he were merely told to do it without explanation. At the same time the presentation should be kept focused upon the point and not allowed to digress to points or topics outside of the lesson or only remotely related to it.

The methods or instruction devices to use for this stage will depend upon the character of the lesson. Possible methods are the lecture (oral or written), the demonstration, the illustration, and the experiment. It is usually well to present the point in various ways by using more than one method; for example, demonstration and lecture (or reading), experiment and illustration, or demonstration and illustration. The apprentice may get the idea from a diagram, from reading an explanation, and from examining the tools and materials or manipulating the mechanism of the machine. Use may also be made of stories, pictures, or models.

Step 3. Application

The new fact or skill represented by the lesson must finally be acquired by the student through his own efforts. In the preparation step he was brought from the responsive attitude to the receptive attitude necessary on his part for the successful presentation, but during these two stages the instructor did all the work. Now too many instructors think that their teaching is completed when they have made their presentation. We cannot too strongly emphasize the fact that *mere telling or showing does not constitute teaching*; this is only part of the teaching-process. If teaching is helping a student to learn, and the learning requires practical performance on

the part of the learner, then the teacher's responsibility is not over until the learner has completed his performance and demonstrated by some kind of test or examination that he has acquired the proficiency in knowledge or skill which the lesson was intended to teach him. Moreover, the application step is a test of the effectiveness of the preceding steps. If the student is unable to perform satisfactorily the action prescribed, the presumption is that the preparation and presentation steps were not properly done by the instructor.

There are three ways of carrying out the step of application: (1) Have the student do something which requires the use of the ideas presented in the previous step and which he cannot perform unless he has grasped the idea (method of practice on the job). (2) Have him write or tell about the idea (method of oral or written examination). (3) Question him about it. In teaching trade skills the first method is the best whenever it is possible and practicable. The second and third methods may become mere memory tests without proving that the student can actually perform the operations involved.

Step 4. Testing or Verification

It is the teacher's duty to ascertain that his students have satisfactorily mastered the knowledge or skill involved in the lesson. Inspection is a more and more conspicuous part of modern industry. If it is necessary to test and check material products of steel, wood, etc., how much more important is it that the complex human product of the trade class should be inspected and its qualities of skill definitely determined.

While students are at work the instructor will be constantly alert in observing them to be sure that the operations are being properly performed. This is all a part of the testing, as is also a critical inspection of each piece of a student's

finished work. A final test at the completion of a unit of lessons will determine the student's proficiency and qualification for advanced work.

QUESTIONS

1. Why may not the several stages of a lesson be considered as occurring in a mutually exclusive sequence?

2. What is the specific purpose or aim of each of the stages of the lesson?

3. Why may not the same methods be used throughout all the stages of the lesson?

4. What is the advantage of each method of approach in the preparation and presentation stages?

5. What are the chief differences between a technical and a production lesson?

6. Explain each of the four stages of a lesson in terms of the laws of learning as given in the first lesson of this unit.

REFERENCES

ALLEN. The Instructor, the Man, and the Job, chaps. xxvii, xxviii.
STRAYER and NORSWORTHY. How to Teach, chap. xiii.

LESSON IV. TEACHING A LESSON IN SHOP WORK

The aim of this lesson is to show more specifically how the several stages of the lesson apply in teaching a lesson involving the acquisition of trade skill.

STEP 1. PREPARATION

In the practical carrying on of instruction the preparation stage involves two phases: first, the preparation which the trade-instructor must make before meeting his students; and,

second, the mental preparation of the student to receive the lesson. The teacher's preliminary preparation (usually called lesson-planning) is an important phase upon which depends in large measure the success of the student in mastering the lesson. It cannot be too strongly emphasized that the successful teacher is the one who prepares carefully in advance for the lessons which he teaches. The items of his preparation should include the following:

1. Determine the teaching-unit. This is done by selecting the lesson topic from the trade-analysis outline. It must be a learning-item either of knowledge or of skill that fits into the student's instruction needs at the time and that is within his capacity for learning by reason of his previous experience.

2. Formulate the purpose of the lesson; that is, state its aim or objective.

3. Classify the lesson as to (1) type — elementary or derived; (2) character — production or technical; (3) approach — informational or developmental; (4) teaching-conditions — shop, classroom, or laboratory, size of class, etc.

4. Outline the teaching-points by analyzing the content or subject matter. These points should be arranged in a desirable sequence or order of presentation. Recognition should also be made of the direct points, that is, those immediately involved in the lesson topic, and the auxiliary points, or related topics which may be used to illustrate or clarify the direct points but should not be permitted to occupy too prominent a place in the lesson.

5. Set up a standard for the student to attain. It is important that this standard be explicit and specific so that the student himself may recognize when the work is "good enough." Trade standards should be used wherever feasible. For example, in machine-shop work a reamed hole or turned

cylinder may be required to be within ± .0001″ of the given dimension. In cabinetmaking a table-top surface must be true with the straightedge, out of wind, and be sandpapered until all marks of plane or scraper are completely removed. In feeding a printing-press, a student must be able to feed a specified kind and size of sheets at a given speed with less than a prescribed number of errors; for example, to feed 1000 sheets of bond stock $8\frac{1}{2} \times 11$ in one hour with not more than ten errors. In some cases the standard will be qualitative; in others, quantitative. The latter is by far the easier for the instructor to check up. There is no skill involved in any trade for which the standard cannot be clearly specified in one way or the other, and such a specification is essential in efficient instruction. While journeyman standards are desirable, it must be recognized that these cannot be enforced with students prematurely. Do not prescribe standards of proficiency that are beyond the capacity of students. If lower than journeyman standards must be accepted at any time, these should be progressively raised in future lessons until the trade proficiency is achieved.

6. Assign a time limit for each stage of the lesson. Time is a constant factor of life and must be considered as one of the vital factors in lesson-planning.

7. Prepare the necessary materials. This includes stock, tools, illustrative materials, etc. For the trade-teacher this item will require much time and effort outside of class hours.

For the preparation stage of the lesson proper — that is, during the instruction period or in preparing the mind of the student to become receptive, as was discussed in our preceding lesson — the following procedure will apply:

1. Establish a point of contact in the student's mind on the basis of ideas or mental concepts which he already possesses.

With students of at least fourteen years entering a trade class or youths of sixteen entering upon an apprenticeship, there is abundant experience from which to draw. Out of this previous observation and general information they must have formed some idea of the nature of the trade and have developed a motive for learning it, else they would not be in their present status of students or apprentices. Out of this background of experience and motive the teacher must select the specific ideas suitable for awakening the interest of the student, then arrange these ideas in a logical order leading to the lesson topic. The possible methods are suggestive questions, suggestive illustrations, demonstration, reference to certain experiences of the student.

In elementary lessons this phase will be more elaborate than in derived lessons. In the latter oftentimes a reference to the preceding lesson is sufficient for the preparation step of the new lesson. The student in electric wiring who has completed the lesson in installing a circuit to ring one bell from one station will need but brief introduction to the lesson on installing a circuit to ring one bell from two stations.

2. Having secured the student's interest by connecting somewhere in his previous experience, lead up to the lesson topic and state clearly its purpose, method, etc.

3. Keep within the predetermined time limit for this stage.

STEP 2. PRESENTATION

1. State clearly the aim, objective, or purpose of the lesson. This marks the transition to this stage of the lesson.

2. Present the new ideas or points in an orderly sequence as previously determined in the lesson outline. Possible methods are demonstration, illustration (stories, pictures, diagrams), experiment, lecture.

The methods are to be selected according to their suitability to the content and aim of the lesson, to the ability of the student to comprehend the lesson, and to the learning economy of the situation.

3. Ascertain that students have grasped the lesson as presented. This is the beginning of the testing phase of the lesson. Before starting to work on the application step the student should be quizzed on the content of the presentation to make sure that he comprehends the information given. This is especially important with students who are to use power machinery. Failure to understand or a misunderstanding of instruction might result in a serious accident.

Right here is the first critical point in the lesson. The student cannot apply the lesson if he has not clearly grasped the information as presented. It may be necessary for the instructor to repeat the presentation, using different devices in order to get the lesson established in the student's mind. Occasionally the failure to establish the lesson is due to the incapacity of the student, but usually it is a result of inadequate or unskilled presentation on the part of the instructor. One vital weakness in the use of printed instruction sheets is at this point. The manipulation and physical activity of the shop work is more agreeable to the average student than the mental effort required to master printed instructions. Students therefore read the informational part of the lesson too hastily or cursorily to comprehend the meaning, and are inclined to proceed with the practice work without the necessary mental preparation. This is one reason why purely correspondence instruction in shop work is not feasible. The personal instructor is necessary for the testing part of the lesson, and at no point is his presence and mastery of the situation more necessary than at this first testing point.

Instruction sheets rightly planned and used are a decided advantage. The instructor must, however, be diligent in ascertaining the student's grasp of the lesson as presented before proceeding with the practice work. In quizzing students on this point you are cautioned against accepting "yes" or "no" answers. Word your questions so that the student must make complete statements in answering.

4. Give explicit directions for the student to follow in the practice or application step. The procedure should be clearly established in his mind before he begins, and should be ascertained by the instructor in the same manner as the informational part. Oftentimes the latter is relatively small in volume, while the procedure may be quite extended. Students should not be permitted to begin work with expensive materials, dangerous tools and machines, or to waste precious time without a definitely established and clearly understood procedure.

5. State the expected standard of achievement. This should be as clearly understood by the student as any other part of the objective of the lesson. He should know what is expected of him, and this knowledge will be really essential for him to attain the standard.

6. Keep within the time limit as prescribed in the lesson plan. Occasionally it may be desirable to take more time than prescribed, but the establishment of a time limit will be a preventive against waste of time. Remember that thoroughness of presentation should be the first consideration and should never be subordinated to an arbitrary time limit.

STEP 3. APPLICATION

Trade skill is a matter of doing, not merely of knowing; of performance, not of information alone. Therefore the application stage of the lesson in shop work should consist

of practice on the job. It is not conceivable that a person can learn a trade skill without practice of it under real working conditions with the tools and materials actually used in the trade. With the presentation phase of the lesson properly performed by the instructor, the student is now ready to proceed with the performance as directed. During this performance the instructor, always alert to see that the student follows directions, continues with the testing stage of the lesson by forestalling mistakes and by giving individual assistance where necessary. Remember that students "learn to do by doing." Therefore do not do for a student what he should do for himself. Help him to reason out his own difficulties as far as possible.

The methods of recitation (both oral and written), of discussion, and of examination may be used to some extent in the application stage, particularly in connection with the informational part of the lesson, but should supplement and not serve as a substitute for manual performance.

The time limit is as important in this as in either of the preceding stages of the lesson.

STEP 4. VERIFICATION OR TESTING

As we have already indicated, this stage of the lesson begins while the presentation stage is still in progress and continues as part of the instructor's activity parallel with the work of application. Observation of students at work is a necessary part of the testing. Finished pieces of students' work should be inspected and checked according to the standards previously set up, and a record made accordingly. This should generally be done outside of class hours.

One item of class management that may properly be regarded as a part of the testing phase of the lesson is the inspection of equipment at the close of the session before the class leaves the room. Students should be taught to leave the tools and materials in proper condition. Neatness, tidiness, and orderliness are important factors in any kind of trade work.

The most important of the instruction devices for use in this stage is the examination, which has been discussed in a previous lesson. Rating of students, which is also an inherent part of this stage, will be taken up in more detail in a future lesson.

STEP 5. GENERALIZATION

At the conclusion of the practice work, or at the next class session, the instructor may review the lesson with the class, making much use of free discussion of the underlying principles of the lesson and of their application in other ways besides the particular exercise or job already performed. For example, the student in beginning lathe work, either in woodworking or on an engine lathe, will find many interesting examples of turned work in his general observation outside of school hours, all of which will give him added interest in his study and practice of lathe work. Students or apprentices in every trade will be interested in observing the products of their respective trades, and this observation should be stimulated and directed by the instructor.

The use at the close of the lesson of the general suggestive questions requiring thought and further study of the topic may be regarded as a part of the generalization stage of the lesson, as is also the suggestion of references to books or periodicals or other sources of further information.

QUESTIONS

1. When will a student derive the greatest advantage from reading about a shop process or operation — before he has attempted it or after? Why?

2. What is the objection to "yes" or "no" questions?

3. What are the excellences and what are the defects in correspondence instruction in shop work?

4. In which of the five steps of the lesson are new instructors likely to fail?

5. In the learning process which naturally comes first, theory or application? Give a concrete example.

6. When a foreman shows an apprentice how to perform some new operation and then directs him to do it, is the whole teaching process carried out? Explain.

7. To what extent does the text of this lesson which you are studying conform with the characteristics of a lesson as herein described?

REFERENCE

ALLEN. The Instructor, the Man, and the Job, Part VI.

LESSON V. LESSON-PLANNING AND TRIAL TEACHING

The aim of this lesson is to present a practical application of the principles set forth in the preceding lesson to serve as an example for teachers-in-training in working out their lesson plans and in testing these plans out in a preliminary trial at teaching.

The lesson plan is to the teacher what the blue print is to the mechanic. No house of any consequence is built without carefully detailed plans, worked out in advance by the architect; no machine is constructed without complete drawings prepared by the draftsman; no enterprise of any

importance is launched without being thoroughly organized on paper. Careful preparation of lesson plans is absolutely essential for successful teaching. The instructor must anticipate every probable contingency and so organize his work that the procedure shall be orderly and economical of time and effort. The written lesson-plans not only make for efficient class work but also become a record of the work of the teacher and may serve as a report to his superiors, stating the content or ground covered, the aim of each lesson, and the methods used in teaching it. It is therefore of vital importance to the teacher-in-training that he learn how to organize his work.

In presenting this matter to the training-class it is desirable to select some operation that involves manual skill and that is possible of performance with the materials and equipment likely to be available in the classroom. This topic can be analyzed and developed on the blackboard through class discussion to serve as a model of a written lesson-plan ; then the leader of the class can conduct the lesson as planned, with the class as students.

A good topic for this purpose, before the days of the "always-sharp" type of pencil or mechanical pencil sharpeners, was the sharpening of a lead pencil. To the suggestion that this is too simple a matter to represent a lesson in shop work, we reply, first, that good teaching consists in taking the simple thing, in analyzing it carefully, and in presenting it clearly so that students may succeed in performing it satisfactorily. Herein is where the beginner in teaching makes one of his first conspicuous errors. He takes too difficult a topic. By reason of his own familiarity with his subject he fails to comprehend his students' difficulties in learning. It sometimes requires much experience for him to get down to

their level. In the second place, teaching a class to sharpen their lead pencils is a typical lesson in acquiring manual skill, which, in its organization and planning, is representative of any lesson in trade skill that any shop-teacher may present. The need for such a lesson may be easily demonstrated by calling for a show of pencil points from members of the class and an examination to determine how many are properly sharpened. The high percentage of poor points will be surprising even among a group of prospective trade-teachers. Who ever heard of a high-school or grammar-school instructor teaching a class how to sharpen their lead pencils! Yet why should not this be a profitable lesson for every boy and girl of twelve years old?

This kind of discussion, worked out inductively, soon gets the interest of the training-class and serves as the preparation stage of our present lesson. We then start off with our presentation stage by writing on the board:

LESSON TOPIC: *Sharpening a Lead Pencil*

Develop each point in the outline with the class, getting the students to suggest the wording as far as possible. They should refer to their outline of the preceding lesson for the sequence of points to be developed into this lesson plan. In this way a plan similar to the following will soon be worked out.

STEP 1. PREPARATION

A. Teacher's preparation:

1. Purpose of the lesson — to teach pupils how to keep their pencil points in the best condition.
2. Classification of the lesson.
   a. Type: elementary.
   b. Character: production.

c. Line of approach: developmental.

d. Teaching-conditions: school classroom with class of twenty to thirty pupils, boys and girls, twelve years old.

3. Points to bring out:

a. Direct —

(1) The correct shape of a pencil point.

(2) Method of cutting the wood and pointing the lead.

(3) Care of point — avoid dropping or chewing.

b. Auxiliary —

(1) Kind and quality of wood used in pencils.

(2) Grades of lead (graphite) and their uses.

(3) Sharpening pocketknife blades.

(4) Use of mechanical pencil sharpeners.

4. Standard of achievement: each pupil is to produce a point, with wood whittled to a neat cone about one inch long, lead projecting about an eighth of an inch, and tapered to a sharp point.

5. Time limit:

Preparation	2 minutes
Presentation	5 minutes
Application (performance) .	5 minutes
Testing	3 minutes
Generalization	5 minutes
Total	20 minutes

6. Materials and equipment: each pupil is to use his own pencil and knife. Provide a few extra for pupils who may not have any.

B. Student's preparation:

IDEA 1. *How many unsatisfactory pencil points are there in the class?*

Ask each pupil to hold up his pencil point while the teacher walks around the class and quickly notes the number of satisfactory and unsatisfactory points.

Ask each pupil to inspect his pencil point and decide whether it is satisfactory or unsatisfactory. All having satisfactory points hold

up hands. The teacher counts and compares with his own inspection. The number of unsatisfactory points will be surprisingly large.

IDEA 2. *What is needed to sharpen a pencil?*

Find how many pupils have knives. Supply knives to those without them.

Point of departure. Now, with so many unsatisfactory pencil points and with the means at hand for sharpening, each pupil should learn how to keep his pencil point in good condition hereafter.

STEP 2. PRESENTATION

IDEA 1. *The proper shape of a pencil point.* Bring out by development and illustration.

IDEA 2. *The correct way to hold the knife.* Developmental if time permits, otherwise informational.

IDEA 3. *The correct way to cut the wood.* Demonstrate.

IDEA 4. *The best way to taper the point.* Demonstrate. By development bring out reasons why.

STEP 3. APPLICATION

Each pupil proceeds to cut away his wood. Caution against trying to whittle the lead until the taper on the wood is completed.

STEP 4. TESTING

The instructor goes down each aisle, observing the students during their operations and inspecting the finished points.

STEP 5. GENERALIZATION

Discuss different kinds of wood, different grades of lead, advantages of different shapes (round, hexagon, oval), care of point, use of mechanical sharpener.

It will be a surprise to a class of trade-teachers to realize that the whole blackboard in the classroom can be covered with such a lesson outline as developed by the class; also

that a seemingly simple operation, like sharpening a pencil, can take up a whole two-hour session of interesting and profitable discussion.

Assignment. At the next session each man is to bring in a lesson topic taken from his trade-analysis chart and worked out into a lesson plan according to this example.

At the next three or four sessions three or four men each time write out their lesson plans on the board for class criticism and discussion. Each man is asked to revise his plan according to this discussion and to turn it in as a part of the written work of the unit. He is then asked to select again from his trade-analysis outline a lesson to be taught, in which he is to use the rest of the class as his students. He is to prepare the lesson plan and submit it to the class leader for criticism and approval prior to the date assigned for teaching it. The topic is to be one that will, as far as possible, be of interest to the rest of the men as students, and one that can be conducted in the classroom with materials and equipment that can be brought in.

On the date assigned the man conducts the lesson as planned. The time given for this varies from half an hour to one hour, according to the subject. Punctuality should be insisted upon, both in beginning and in stopping. The trial teacher must bring in the materials and tools necessary for the practice work by the class. This difficulty has not been as great as would at first appear.

The members of the class acting as students are requested to respond in all sincerity, laying aside for the time being all friendly joking that might embarrass the man who is teaching his first lesson. This requires the exemplification of the golden rule, since each man knows that he is to have his turn on the program. At the conclusion of the time set, the

neophyte teacher takes his seat, and the class is then invited to turn critic and tell him what were his good points and his failures in the light of the principles of teaching as laid down in preceding lessons. This has always been taken in good spirit by the man under fire, and he usually goes home after his first attempt feeling that he has made pretty much of a failure of it, but anxious to try again and determined to do better the next time. He should have a second trial, taking a new lesson topic.

An ideal situation would be to have the training-class conducted in a vocational evening school, so that this trial teaching might be done with boys of the day school who were brought into the evening class to serve as pupils for the trial teacher. The trial lesson should always be followed by criticism and discussion after the pupils have been dismissed. Teaching these lessons in the shops with the regular shop equipment adds much to the interest and effectiveness of the work. The development of trade-teacher training will demand more favorable facilities for this trial teaching. Something along the lines of the practice teaching under criticism in the normal schools is much to be desired.

QUESTIONS

1. What are some specific advantages in writing out lesson plans?

2. In what respects are lesson plans similar to the drawings or other forms of organization with which you are familiar in your trade work?

3. What particular features of lesson plans are different from industrial-planning details?

REFERENCES

ALLEN. The Instructor, the Man, and the Job.
GRIFFITH. Teaching Manual and Industrial Arts, chap. xii.

Lesson VI. Class Management

The aim of this lesson is to summarize the previous lessons of this unit in anticipation of the work of the following unit, on " Practice-Teaching " ; also to give some suggestions relative to the details of management which must receive attention by the shop-teacher. The unit of " Shop Management," which treats of this subject more fully, is not intended to be studied by the teacher-in-training until he has had some practice-teaching experience.

First of all, the shop-teacher must realize that successful teaching depends upon careful organization of all details of his work. He has to consider all the pedagogical details that the academic teacher has ; but, in addition, there is the complex situation involving elaborate equipment and numerous items of materials and supplies. The complexity of the shop-teacher's job imposes the necessity for careful organization in order to economize in time and materials, secure good discipline, and make for maximum efficiency.

This problem of organization is fourfold :

1. Organization of subject matter.
2. Organization of equipment and materials.
3. Organization of class routine.
4. Organization of records and forms.

1. ORGANIZATION OF SUBJECT MATTER

The first step in this problem is the analysis of the trade, which has already been considered in Unit One. As previously stated, this trade analysis is not a curriculum or course of study. It is like the pile of bricks in the yard from which may be built any structure desired. Whether the whole pile shall be used depends upon the size of the structure. Likewise

the trade analysis is only a classified reservoir or supply of teaching-material. How much of it shall be used in any given course depends upon a number of factors; for example, the purpose of the course, the time available, the equipment, and the age, character, and general capacity of the students. In no trade-school course will it be possible to include every item of the trade-analysis outline, much less in a prevocational or manual-training course. The instructor's problem, then, is first to select from his trade-analysis reservoir the items that are feasible for the conditions of his situation. If he is to give a day-school course covering two years, each to consist approximately of one hundred and eighty days of three hours, the subject material must be selected accordingly. The same outline of teaching-topics will not fit a one-year evening course of seventy two-hour sessions for men already working at the trade.

Having outlined the prospective material for the whole course, it must then be arranged in a learning-difficulty sequence. In some schools it will be required to organize the outline into term or semester units. Next the sequence of lesson topics must be listed. For each lesson the aim or purpose should be specifically stated, as well as the standards of achievement to be required and the type of job which will furnish the necessary practice. Some trade-teachers prefer to work out their course in terms of jobs arranged in proper sequence, instead of by lessons. We need have no quarrel over terminology as long as the ultimate end is achieved.

All the organization of subject matter thus far mentioned should be made before the work of the course actually begins. As the work proceeds, however, the teacher should organize his work day by day in the form of lesson plans, as was discussed in the preceding lesson. Oftentimes in shop work the

practice work of any lesson may continue through several days, in which case the daily plan will not be in terms of a complete new lesson to be presented. This should not exempt the instructor from noting each day before leaving his classroom just what each student is to do the following session. This not only makes for definiteness in the work, but it is invaluable in case of emergency where a substitute teacher must take charge of the class. The teacher's plan book should not be considered a private matter. Many schools require this plan book, properly posted up, to be left *on* the teacher's desk each day before leaving. This is a different matter from the private notebook which each progressive instructor will keep and in which he will enter from time to time such data as may seem valuable for future reference or as a matter of personal growth. The work of each student should be anticipated, and a new assignment should be ready for him as soon as any job is completed. Nothing will produce chaos and disorder more readily than to have students waiting for the instructor to hunt up something for them to do. Such a condition should never be allowed to happen.

The actual instruction activity of the class is facilitated by the use of instruction sheets, written job orders, etc. In our vocational pedagogy the importance of performing actual rather than simulated jobs has been strongly stressed. In assigning jobs it is the duty of the instructor to see that any given job includes the specific skills that are within the student's learning capacity and needs at the time and that properly conserve his time and effort. This means as little repetition as possible of skills already mastered. It also means that every production job undertaken should be carefully analyzed into its *instruction factors* to determine the specific skills involved. These skills should be distinctly stated on

the job order, so that the student may recognize the specific instruction-advantage that he is to acquire from the performance of the job. The forms of job orders used in vocational schools have a tendency to imitate too closely those of the commercial shop, where the aim is production and financial profit, and have not yet been drafted in such form as to indicate the instruction opportunities involved, the skills for the student to learn. This is a matter to which the new teacher should give special attention.

2. ORGANIZATION OF EQUIPMENT AND SUPPLIES

The shop-teacher must see that all necessary tools and materials are provided, so that each student can work to the best advantage, at the same time avoiding waste or extravagance. The charge of "over-equipped and under-taught" has been made (and with some justice) against some school shops. Do not let this be charged against you. Good teaching is not merely a matter of equipment. Some excellent training has been given in schools with meager equipment, while some of the poorest teaching of shop work has been carried on with the best of equipment. It is solely a matter of the teaching-skill and the ability of the instructor himself.

To do good teaching the tools, machinery, and supplies must be thoroughly organized. This is accomplished in most school shops by means of tool cribs and stock rooms, with special and orderly provision for each item, and by the use of checking systems to account for all items. In some places paid tool keepers are employed; in other schools students are given the duty of keeping the tool room. There is much instruction value in this when properly managed. Students should not be exploited for it, but should be assigned the work in rotation, giving each one an equal chance. Making the

care of tools a definite item in the instruction course, credited equally with any other unit, gives this work a dignity and importance in the minds of students.

Students should always be required to do as much as possible in caring for the equipment because of the instruction value to them, but this does not exempt the instructor from final responsibility in the matter. The time that he spends in organizing and arranging his equipment is amply repaid in the increased efficiency in the use of it by the class. No class should ever be dismissed without a final inspection by the instructor to see that every item is in place or properly accounted for. Keeping all tools sharp and in proper working condition is an important phase of this work. Students should not be allowed to work with tools in poor condition ; the very highest standards of workmanship should be required, and the best examples of working conditions should be set before them. To achieve an ideal or even satisfactory condition of equipment will require much time and energy on the part of the instructor outside of class hours.

3. ORGANIZATION OF CLASS ROUTINE

A certain established procedure should prevail for every shop-class session. Students should be required to assemble punctually, to enter in an orderly manner, and to proceed with their work with a minimum of confusion. This is facilitated by having the equipment and lesson materials thoroughly organized and in proper condition. Provision should be made for the care of pupils' clothing, both street clothes and shop clothes ; also for their work, both finished pieces and materials under operation. Certain general details of the shop may be assigned to specific students, distributing these duties throughout the class as equitably as possible. A written schedule of

duties posted on the wall will help to fix responsibility, to systematize the work, and will make for general efficiency. Good teachers have these matters so thoroughly organized that when a class enters the shop, each student quietly takes his place until the roll is called. Then the instructor can fold his arms and, without a word, watch while each boy attends to his specific duty in starting in. Then the instructor proceeds with his own lesson exercise. For example, in a woodworking shop one certain boy has the duty of lighting the gas at the glue pot at the beginning and of turning it out at the close of the session. This is his sole duty; if it is not done, the responsibility is easily fixed. It is an easy matter to assign enough duties of this kind to provide for every student in the class, thus making the labor light for each one. Boys enjoy it; they respect the organizing ability of their instructor. With a routine thus established, the work can be put away at the close of the session, a careful final inspection made by the instructor, and the class dismissed without confusion and in a minimum of time.

In the matter of cleaning up the shop it is sometimes a question of where the pupil's duty ends and the work of the janitor begins. Certainly the janitor should not be expected to clean off benches or to put away tools. The student should be required to perform all that the mechanic in his trade usually does. In these matters there is much educational value to students that should not be overlooked. They should clean off all machines and benches, put away all tools and materials, and leave the shop generally shipshape, even to sweeping the floor. The latter may not be feasible in mechanical-drawing or academic rooms or in laboratories, but in many schools it is successfully performed in printing-shops, electric shops, woodworking shops, machine shops, automechanics shops, etc.

Occasionally a student may rebel against this work, feeling that it is beneath his dignity. Parents may even complain that their boys are compelled to do janitor work; but when it is explained that the cleaning up is regarded as a valuable factor of instruction, that the work is equitably distributed among the members of the class, and that there is no motive of relieving the janitor of any legitimate work, the objection is usually withdrawn. The whole question should be settled upon the basis of the profit accruing to students from the standpoint of instruction. Such work should not be imposed upon them if there is no learning value in it. Certainly no necessary work is degrading in itself; it is made so only by the motives and attitude attending it.

The responsibility for the care and tidiness of the shop should rest solely with the instructor. His efficiency can be pretty accurately judged by the appearance of his shop, without seeing either him or his students. The atmosphere or general condition in which he leaves his shop at the close of the day tells unmistakably what kind of a man he is, whether he is neat or slovenly, orderly or careless, systematic or shiftless, ambitious or indifferent, energetic or lazy. He reveals in the objective features of his shop the standards and habits which his students inevitably acquire. The visitor entering the shop, whether the teacher is present or not, will in a few seconds get a fairly correct impression of the kind of teacher who is in charge of the place. In an effort to help teachers to make their shops conform to the highest possible standards of tidiness, order, and system, the following schedule of physical details was prepared by the New Jersey State Department of Vocational Education and presented to the shop-teachers of the state. All shop-teachers will do well to check up their shops frequently by such a schedule.

SCHEDULE FOR RATING CONDITION OF SHOPS IN VOCATIONAL SCHOOLS

	Observation Points	Possible Rating	Allowed Rating
Benches (40 points)	Are they of proper construction?	5	
	Are they arranged properly?	5	
	Are they clean?	5	
	Are drawers kept clean, with tools and materials carefully arranged?	5	
	Are drawer pulls and slides in good repair?	5	
	Are tops in good condition (free from splinters and tool marks)?	5	
	Are vises in good condition and properly fastened?	5	
	Is space under bench clear of discarded clothing, spoiled and unfinished work?	5	
Machines (40 points)	Are they arranged in proper position?	5	
	Are they clean?	5	
	Are dangerous parts properly guarded?	5	
	Is the machine in such repair that it is safe? (Note. Dangerous parts may be guarded, but machine may need repairs that make it generally unsafe.)	5	
	Are parts and attachments in good condition and kept in their proper places?	5	
	Are drip pans provided for counter shafts etc.?	5	
	Are waste-material boxes provided on or near machines, and are they emptied and boxes cleaned?	5	
	Are lighting attachments in good condition and are globes clean and properly guarded?	5	

	Observation Points	Possible Rating	Allowed Rating
Cabinets (20 points)	Is the exterior in good repair — knobs and hinges in place, full, unbroken lights of glass, glass panels clean, top and space behind cabinet free from materials or tools?	10	
	Is the interior neatly arranged — compartments cleaned and labeled and contents in place and clean?	10	
Material (35 points)	Is the arrangement neat and systematic?	5	
	Is the arrangement accessible for selection or inventory?	5	
	Are the arrangements safe?	5	
	Are lubricating-material containers provided with proper facilities for filling smaller cans?	5	
	Is floor near containers free from excessive oil?	5	
	Are paints, oil, and greases stored so that they cannot be regarded as fire hazard?	5	
	Are paints, stains, and gasoline stored to reduce evaporation to a minimum?	5	
Tool Room (55 points)	Are benches well arranged?	5	
	Are benches in good condition?	5	
	Are the tool racks adequate?	5	
	Are tools accessible and arranged for easy inspection?	5	
	Are tools sharp and in good repair?	5	
	Are tools in proper (proportionate) quantities?	5	
	Are tools marked with size, also name of school?	5	
	Is the check system adequate?	5	
	Is the tool crib located in the best possible place?	5	
	Is the tool room kept clean?	5	
	Is the tool room properly lighted?	5	

	Observation Points	Possible Rating	Allowed Rating
Teacher's Desk (20 points)	Is it properly located?	5	
	Does it present an orderly appearance?	5	
	Is material in drawers properly arranged?	5	
	Is floor under and around desk free from miscellaneous litter?	5	
Teacher's Library (20 points)	Are the books trade books or related to trade subjects, and are they up-to-date?	5	
	Are they arranged in orderly manner?	5	
	Are books and blue prints classified, card indexed, and numbered?	5	
	Are shop blue prints properly mounted and readable?	5	
Obscure Corners (20 points)	Are corners clear of junk and rubbish?	5	
	Is there a regular clean-up period?	5	
	Are pupils utilized for shop clean-up?	5	
	Is there a systematic inspection?	5	
Walls, Fixtures, and Hangings (40 points)	Are the window shades in good condition?	5	
	Are the walls full of nails to support material that should be filed or stored?	5	
	Are the pictures up-to-date and related to the shop?	5	
	Are manufacturers' sample boards up-to-date and complete?	5	
	Is the shop clothing of students not in shop properly hung?	5	
	Is the street clothing of students in shop properly hung?	5	
	Are the clothing-hooks in good condition?	5	
	Are the window sills clear?	5	

	Observation Points	Possible Rating	Allowed Rating
Cleaning Materials and Shop Accessories (50 points)	Are brooms, brushes, and shovels hung in a proper place and in an orderly manner?	5	
	Are sinks clean?	5	
	Are soap and paper towels in proper place?	5	
	Is clean cotton waste kept in suitable containers?	5	
	Are oily cotton waste and cloths kept in fireproof self-closing cans?	5	
	Are cans in good condition and properly located?	5	
	Is the surface of these cans clean?	5	
	Are cans and waste boxes emptied daily after last sessions of class?	5	
	Are ladders and belt shifters in good condition?	5	
	Are ladders and belt shifters stored in an accessible place?	5	
Care of Students' Work (25 points)	Is work in progress properly stored?	5	
	Is finished work assembled and put to use?	5	
	Are exhibits of pupils' work up-to-date?	5	
	Are exhibits of pupils' work complete and well mounted?	5	
	Are exhibits properly labeled?	5	

4. ORGANIZATION OF RECORDS AND FORMS

The shaping of the vocational career of the student is a sacred trust committed to the trade-teacher, and it is of sufficient importance to demand an accounting. Records are therefore an inevitable phase of the instructor's work. Be it further remembered that these records reveal not only the instructor's evaluation of the student's achievements and general worth, but they also reflect the judgment and general efficiency of the instructor himself. Many schools have now developed their systems of records, to which the new teacher must conform ; but there is still opportunity in most places for much contribution in this matter. In a new shop the instructor must develop to a large extent his own system of record-keeping. For the benefit of such teachers a few fundamental principles of record-keeping are here suggested.

First, records are kept primarily for the benefit of the student, for whom the school exists, to whom all instruction must be adapted, and to whose interest all school methods and procedure must conform. No record of any kind is justifiable in a vocational school, or in any other school, that is not in its final analysis concerned with the welfare of the student.

Second, records should be accurate and fair, divested as far as possible of all personal opinion. The illuminating studies recently made in educational tests and measurements will furnish much of valuable suggestion and guidance in this matter. The teacher of shop work has many objective and impersonal factors entering into his calculations which aid greatly in eliminating the personal element.

Third, records should show pertinent and essential facts. A term standing of 90 per cent for shop work is vague and

indefinite; it may mean much or little, usually little. It does not indicate the kind of work performed, the skills acquired, the time devoted to the work, the student's relative aptitude or capacity, or his stage of progress in the course as a whole. Something more specific is desired.

Fourth, records should be readily intelligible to all parties concerned. This brings up the whole perplexing question of rating students, of which more will be said later.

Fifth, the system of record-keeping should be as simple as possible, not too cumbersome nor requiring an unreasonable amount of clerical labor on the part of the instructor. We have all seen the man in the teaching-position (notice that we do not speak of him as a *teacher*) who is given to the line of least effort and who keeps perfunctorily only such records as his superiors prescribe; and occasionally we find the conscientious and ambitious teacher who develops a system of time slips, card indexes, charts, and ledger volumes that keep him working nights, Sundays, and holidays to post up. Both of these extremes are undesirable; a happy medium should be sought.

These are some self-evident principles of record-keeping. The question now is, What kind of records are desirable in conformity with these principles.

The initial item in record-keeping is the trade-analysis chart, on which is given the specific skills which the workman in the trade must exercise and which the student must acquire. The next item is the curriculum or outline of the skills which the student is expected to learn in school. There will be many skills that he must acquire after he leaves school and enters upon his actual trade apprenticeship. If this fact can be impressed upon him, he will begin his apprenticeship with less conceit than vocational-school graduates often evince.

The analysis chart and curriculum chart (the chart form is of much advantage) are fixed records, which need to be made out but once and which are used thereafter for reference. They are not usually thought of in the class of records, but it is our belief that they must be considered in a comprehensive system of trade-class organization.

Next comes the group of working records that must be written out from day to day or as the work progresses. In this group are the following:

1. The job-analysis records, preferably charts, showing the instruction values to be derived from the various projects undertaken in the school shop.

2. The job-assignment records, including the teacher's plan book, the job cards, envelopes, etc., often facilitated by card-index devices.

3. Job-progress records must also be kept. This is accomplished by means of charts or card indexes.

4. The most important of all records are those showing the progress of students. It should always be possible to ascertain readily just what items of skill any student has learned, and those which remain for him to master. One of the most effective devices for this is the progress chart copied from the construction charts commonly used by architects and engineers for checking up the progress of work on their contracts. This form of chart is now used in many schools.

5. Report cards are, in all well-organized schools, issued at stated times, giving an evaluation of the student's proficiency. The question of rating students, which has been so perplexing for shop-teachers, will be treated more fully in a later unit. We will here mention the customary method of blanket rating in percentage as being decidedly unsatisfactory. To say that a student's standing for the term is 90 per cent

means very little when the matter is carefully analyzed. It would mean more to him and his parents to say that during the term he had acquired such and such specific skills or had evinced certain specific, undesirable characteristics which should be corrected.

6. Finally, there are the permanent records for future reference, usually filed in the school office, and including not only a statement of the student's school achievement but also providing for follow-up records of his trade career after leaving school.

We have not mentioned the records of supplies, inventories of equipment, etc., which the shop-teacher must keep. These are impersonal items and may be kept after the methods of commercial shops. This topic will also be treated more at length in a later unit.

QUESTIONS

1. To what extent does the shop-teacher have to consider all the pedagogical details common to the academic teacher?

2. What are the specific advantages of having the equipment and materials of the shop well organized?

3. Outline a course of units in your trade for apprentices in the industry, to be given in evening classes during one term of seventy-five nights, two hours each session. Assume a capacity of fifteen students per class.

4. Select a production job that is feasible to perform in such a course, and list its *instruction* factors or possibilities for your students.

5. What advantages are derived from having analysis charts and progress charts posted on the walls for the inspection of students?

6. What objections might there be to this?

7. What are some of the objective or impersonal factors in shop record-keeping?

8. What is the advantage in showing students' progress on a public progress-chart?

9. Make a list of at least fifteen daily duties for your shop, which may be distributed among your students.

10. What is the value in calling the roll at the beginning of each session?

11. To what extent may commercial-shop regulations be imposed in the school shop?

12. What do you think of the practice of having students inspect their individual equipment regularly upon entering the shop, reporting immediately any that may be missing or in bad condition?

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LESSON VII. ETHICS OF THE TEACHING-PROFESSION

The aim of this lesson is to present to teachers-in-training about to begin practice-teaching some suggestions relative to the more intimate and delicate aspects of the teacher's work.

PROFESSIONAL STATUS OF THE TEACHER

At the outset the tradesman or mechanic should realize that teaching is a profession rather than a trade. To appreciate this status let us note the difference between a *trade*, a *craft*, a *business*, and a *profession*. The term *trade* applies

particularly to the mechanical occupations. *Craft* is often interchangeable with *trade*, but it is used in a broader and nobler sense. It implies possession of a wider range of skill and versatility and more of native aptitude or dexterity. We speak of the trade of the carpenter or compositor, but the craft of the woodworker or printer. A *business* is an occupation of a mercantile or commercial nature; that is, connected with buying or selling. In a trade the worker's chief concern is with earning his daily bread. In a craft the worker is prompted also by the instinct of construction expressed in some kind of material form. In a business the chief motive or reward is financial gain. The term *profession* designates a more learned calling or vocation. The ancient learned professions, as recognized and fostered in the medieval schools and universities, were theology, law, and medicine. In modern times this list has been considerably extended, and we now recognize sculpture, art, drama, engineering, and teaching as professions of equal rank and dignity with the original three.

The teacher, and especially the trade-teacher, should appreciate the full significance of the term *profession* in order to live up to it. It is distinguished from the other terms, *trade*, *craft*, and *business*, as follows:

1. It signifies a deliberate choice of a specific career and exclusive devotion to it.

2. It requires a long, unproductive period for preparation.

3. It involves the idea of special personal service to mankind as distinguished from the idea of private gain in business careers.

4. It requires superior endowment of native intelligence.

5. It sets up rigid standards for entrance.

6. It prescribes certain restrictions and regulations for practice.

Probably no term is more abused or misused than the title "Professor." In popular parlance it is loosely applied to a variety of persons who perform unusual or spectacular feats. The balloonist, the animal tamer, the magician, the acrobat — all are given this honorable designation by the unthinking multitude. The title legitimately applies to one who has been duly elected to a professorship in a college or institution of higher learning which is legally authorized to grant the title.

The lower teaching-positions in colleges are instructorships, not professorships. The incumbent who follows a vocation classed as a profession does not merit the title of "Professor," nor does the person who holds merely a teaching-position. The common practice of speaking of any male school-teacher as "Professor" is unwarranted. When you begin teaching you cannot prevent your friends from calling you Professor, either in jest or in earnest, if they so desire; but you can refrain from the application of the honorable term to persons to whom it does not rightfully belong.

THE TEACHER'S PLACE IN THE SCHOOL ORGANIZATION

The duty and responsibility of the teacher are of a different nature from those of the mechanic. He should thoroughly understand his relationship to his superiors, to his fellow teachers, and to his students. Fig. 6 shows graphically the usual organization of a public-school system, although some variations will be observed for some cities or states. It will be seen that the teacher is usually responsible directly to his principal or director. For special subjects, including shop work, there is often a special supervisor whose authority is only advisory with reference to the technique of his particular subject. The management of the school is solely the

office of the principal, to whom the teacher is directly responsible. Teachers should not carry matters over the head of their principal to the superintendent of schools or to the

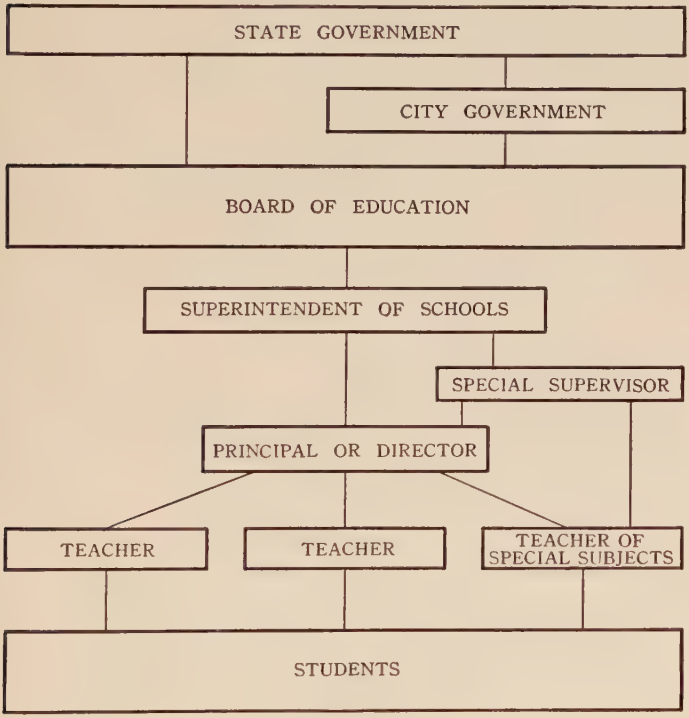

FIG. 6

members of the board of education. Such action is discourteous to the principal and contrary to professional ethics.

The teacher is also placed in a position of responsibility for the behavior of other persons; namely, his students. This the mechanic does not have unless he occupies a position as foreman or superintendent. This implies possible contact with

the parents of his students, and imposes a social responsibility by no means to be lightly considered. The influence of his personality upon the impressionable minds of his students is a potent factor in molding their lives and characters, and parents have the right — it is even their duty — to know personally the teachers of their children. The relationship between teacher and parent should ever be one of utmost candor and frankness, with no other motive than to promote the welfare of the child. This relationship is similar to that of the lawyer, doctor, or clergyman toward client, patient, or parishioner in being one of intimate personal confidence. Information obtained by the teacher relative to physical, moral, or financial conditions in the homes of his students should be kept in strictest confidence. He should in no way offend by reference to any unfortunate family circumstances. In many instances he has an opportunity to make himself a real friend and benefactor of such families. His sphere of personal service should be much larger than his classroom or school shop.

Rating of Teachers

In every progressive school system it is the practice, usually prescribed by official regulation, for the principal or director to report at stated times, at least once a year, the rating of the teachers under his direction. These ratings are entered upon the permanent records of the school system and form the basis for determining promotion, advance in salary, or other preferment. Various systems or devices are used in different communities, but there is usually an effort to evaluate the teacher upon the important factors of his work. The competent instructor has little to dread from the rating, but in the case of a teacher whose work is unsatisfactory the

rating system is or should be a means of determining the particular shortcomings to the end of helping him to improve upon them if possible. In public schools the shop-teacher is a newcomer into the teaching-ranks, and as yet he has not appeared in great numbers. Consequently the rating schemes in many cases are constructed with regard to the teacher of academic work and do not adequately provide for evaluating the particular qualities or factors of the shop-teacher. This matter is being given serious attention by school officials, and special rating schemes are being devised for shop-teachers.

The following score card has been used in a vocational school with satisfactory results. It will be noted that under "Discipline" and "Teaching Ability" 50 per cent of the possible points in each group represent activity of the pupils, resulting from the influence and stimulus of the instructor. It seems perfectly reasonable and fair to judge an instructor by the behavior and achievements of his students.

SCORE CARD FOR RATING TEACHERS

A. Discipline	Possible	Allowed
Voice: tone and manner	5	
Self-control	5	
Tact	5	
Firmness	5	
Dignity	5	
Sense of justice	5	
Enthusiasm	5	
Manner of assembling and dismissing classes	5	
Alertness	10	
Pupils' respect for teachers	15	
Pupils' habits of neatness and order	15	
Pupils' behavior	20	
Total	100	

B. Interest	Possible	Allowed
Time spent outside of class hours in preparing work or equipment	20	
Zeal in preparing devices for interesting pupils: exhibits, charts, models, etc.	20	
Time spent outside of class in helping pupils	10	
Interest in pupil activities	10	
Coöperation with other teachers	10	
Efforts at self-improvement: attending educational meetings and visiting other schools	10	
Reading professional literature	10	
Taking professional courses	10	
Total	100	

C. Teaching-Ability	Possible	Allowed
Knowledge of subject matter	5	
Organization of subject matter	10	
Presentation of subject matter	10	
Professional preparation	3	
Use of English	3	
Records of pupils' progress	3	
Accuracy	2	
Initiative and resourcefulness	2	
Neatness of shop or classroom	3	
Efficient care of equipment and materials	4	
Attention to individual needs	5	
Interest of pupils in their work	25	
Progress of pupils	25	
Total	100	

Every teacher has a right to know his rating if he so desires, but it is better for him to give his best effort to his work and not worry about the rating. The most creditable motive for desiring to know a rating is to learn what are one's weak points (according to the judgment of the official making the rating), to the end of strengthening these points

if possible by self-discipline. It is far better and less likely to engender ill-feeling if teachers can discover and improve their own unsatisfactory characteristics.

A most worthy device for this purpose is the Teachers' Self-Estimate Chart for the professional betterment of teachers of shop work in elementary schools of New York City. This chart is printed herewith by permission.

TEACHERS' SELF-ESTIMATE CHART

Appearance of Shop

1. *Placing of equipment:* arranged to best advantage _____ unsystematic _____
2. *Decoration:* appropriate _____ overdone _____ unattractive _____ lacking _____
3. *Blackboards:* much used _____ little used _____ clean _____ mussy _____
4. *Number of pupils:* satisfactory _____ too many _____ too few _____
5. *General appearance of room:* neat _____ orderly _____ clean _____ untidy _____ disorderly _____ dirty _____

Care of Shop

1. *Tools:* *a.* Chisels: sharp _____ need honing _____ need grinding _____
   b. Planes: sharp _____ need honing _____ need grinding _____
   c. Saws: sharp _____ fair _____ need filing _____
2. *Arrangement of tools:*
   a. In benches: advantageously arranged _____ careless _____ unsystematic _____ good racks _____ racks need replacing _____
   b. In closet: advantageously arranged _____ careless _____ unsystematic _____ good racks _____ racks need replacing _____
3. *Benches:* clean _____ dirty _____ marred _____ need repairing
4. *Vises:* in good order _____ well oiled _____ broken _____ need new face plates _____

Organization

1. *Records and reports:* accurate _____ neat _____ inaccurate _____ careless _____ on time _____ late _____

2. *Class management:* systematic _____ effective _____ ineffective _____ no definite plan _____
3. *Monitor system:* effective _____ followed up _____ ineffective _____ no definite plan _____
4. *Discipline:* quiet _____ natural _____ military _____ noisy _____ lax _____
5. *Teamwork:* successful _____ lacking _____

Selection of Material

1. *Selection of problems:* have informational content _____ interesting _____ adapted to ability of boys _____ exercise only _____ uninteresting _____
2. *Constructions employed:* follow approved practice _____ unusual _____ freakish _____ violate principles of construction _____
3. *Design of models:* well proportioned _____ suited to purpose _____ appropriate decoration _____ poor proportion _____ not suited to purpose _____ decoration not appropriate _____

Instruction

1. *Class teaching:* stimulates thought _____ material well organized _____ effective illustrations _____ dictated _____ confused _____ sufficient in quantity _____ not enough _____ too much _____
2. *Individual teaching:* developmental _____ dictated _____ confused _____ sufficient in quantity _____ not enough _____ too much _____
3. *Questioning:* stimulates thought _____ purposeful _____ aimless _____ excessive _____ not enough _____
4. *Demonstrations:* effectively presented _____ well analyzed _____ interesting _____ boys take part _____ confused _____ uninteresting _____ teacher does too much _____
5. *Blackboard illustration and teaching-material:* plentiful _____ effective _____ ineffective _____ meager _____
6. *Supervision:* prevents carelessness _____ develops self-reliance _____ excessive _____ too little _____ kills initiative _____

Results of Instruction

1. *Boys' work:* accurate _____ well finished _____ careless _____ poorly finished _____

2. *Manner of working:* workmanlike ------ unworkmanlike ------ good posture ------ improper posture ------ independent ------ initiative lacking ------
3. *Interest developed:* in construction ------ in mechanical achievements ------ in applied science ------ in craftsmanship ------ in design ------ interest lacking ------

Personal Characteristics

1. *General appearance:* vigorous ------ weak ------ timid ------ neat ------ in bad taste ------ slovenly ------ poised ------ nervous ------ embarrassed ------
2. *Posture:* erect ------ stooping ------ slouching ------
3. *Health:* robust ------ healthy ------ tired ------ anæmic ------ sick ------
4. *Voice:* pleasing ------ harsh ------ nagging ------ clear ------ indistinct ------ too loud ------
5. *Manner:* pleasing ------ courteous ------ cheerful ------ sympathetic ------ dignified ------ displeasing ------ discourteous ------ gloomy ------ unsympathetic ------ undignified ------
6. *Interest:* industrious ------ lazy ------ enthusiastic ------ optimistic ------ energetic ------ interest lacking ------
7. *Adaptability:* resourceful ------ unresourceful ------ teachable ------ unresponsive ------
8. *Self-control:* tactful ------ blundering ------ wins coöperation ------ antagonizes ------ even tempered ------ irritable ------
9. *Sincerity:* marked ------ questionable ------

Professional Characteristics

1. *Professional growth:* ambitious ------ studies ------ reads ------ writes ------ experiments ------ not interested in professional improvement ------
2. *Professional interest:* understands children ------ interested in the lives of the pupils ------ interested in the life of the school ------ unsympathetic with children ------ takes no part in the activities of the school ------
3. *Professional preparation:* carefully plans term's work ------ makes daily preparation ------ has no adequate term plan ------ makes no daily preparation ------

PROFESSIONAL RELATIONS

1. *With pupils:* kindly ____ interested ____ exerts good influence ____ impatient ____ commanding ____ unsympathetic ____ uninteresting ____ influence of doubtful value ____
2. *With principal:* coöperates ____ secures interest of principal in the shop ____ secures the principal's confidence ____ antagonistic ____ complaining ____ untactful ____
3. *With supervisor:* cordial ____ coöperates ____ accepts criticism ____ teachable ____ complaining ____ resents criticism ____ hard to convince ____ regular in conference attendance ____
4. *With fellow teachers:* well thought of ____ actively interested in the welfare of the corps ____ self-centered ____ takes no part in the activities of the group ____

Cardinal Qualities of a Teacher

The discussion of rating brings up the question of what particular qualities should characterize a teacher in addition to those indicated on the score card and the chart shown on preceding pages. A few of the qualities which are applicable to all teachers and which have special reference to shop-teachers are here briefly discussed.

1. **Initiative.** A shop-teacher must go ahead and plan out his work without detailed direction. He should be able to do the right thing at the right time without being told to do it. He has far greater freedom and latitude of action than does the mechanic. As yet he is working in a pioneer field, with very few of the real problems of the work solved. His is both the opportunity and the duty to develop new methods and originate new devices; he must be constantly resourceful in solving the numerous problems that confront him every hour.

2. **Energy.** The teacher must work in season and out of season, early and late. There are no union hours for the good instructor. The apparently shorter working day and

frequent vacations, as compared with working at the trade, should be for the true teacher but the opportunities for preparing himself and the details of his work so that the actual hours of class work will be as profitable as possible for his students. The amount of out-of-class work required of a teacher, and especially of the shop-teacher, is not fully appreciated by people outside of the school.

3. **Growth.** A teacher must ever seek to improve himself by every possible means. He should be a diligent student of his subject, read professional literature (he should subscribe to two or three publications), take summer courses in pedagogical subjects, belong to teachers' clubs, and attend educational conventions. This will require energy and expense, but it is the inevitable price of his success and promotion.

The trade-teacher should also recognize that in almost every industry new inventions are being rapidly introduced, often imposing very radical changes in trade processes and working-conditions. It therefore behooves him to keep up to date by keeping in close touch with his industry, even to the extent of returning to it as a workman occasionally during his vacations.

4. **Coöperation.** This is a most important quality in the teacher. His personal relationship is very complex. He must work harmoniously with his fellow teachers and his superiors. Oftentimes he will need to yield his own notions for the sake of harmony and the welfare of the school and, above all, of his students. One essential feature of coöperation is the sharing of professional materials. When the code of ethics for teachers is finally formulated and accepted, quite likely this will be a prominent item. The true teacher receives from his fellows in proportion as he gives. If he selfishly withholds his materials, he cannot expect to receive assistance

from others. Trade-teachers, with their opportunities for trying out new devices and methods, should be willing to give to their fellows the benefit of their experience in a spirit of mutual helpfulness. Herein lies the value of teachers' conferences.

5. **Exemplary Personal Life.** The example of the teacher before his students is a most serious matter. He should be above criticism and reproach in matters of speech, dress, habits of living, punctuality, integrity, and moral character. By reason of these qualities he should command the highest respect of his students, his associates, and the community in general.

6. **Loyalty.** This is the foundation stone of the school system. The teacher should ever be willing to subordinate his own ideas to those of his superiors. He should have no other motive than to promote the welfare of the school by exercising the utmost discretion and good judgment in all his relationships. By all means he should refrain from criticism of his superiors or associates. He should ever be characterized by professional fidelity. He should regard a contract as a serious moral obligation never to be violated. When a teacher is offered a better position elsewhere, it is his duty to confer in the matter frankly with his superiors, but the latter should impose no obstacles to his advancement or progress. Because of the difficulty and care to be exercised in selecting a successor, a teacher should give ample notice in leaving a position. Thirty days is the usual practice. No honorable school official or agency will expect a teacher to leave on a shorter notice unless a successor is available so that no embarrassment results in the class work.

The shop-teacher should ever realize his obligation to the public. He is the custodian of thousands of dollars' worth

of public property. This valuable mechanical equipment intrusted to his care has only one legitimate use: to train students to become efficient and intelligent producers and worthy members of human society. He is thus charged with a large public responsibility, and in this capacity he should be an example of public fidelity and the highest type of loyal citizen.

7. **Mastery.** No characteristic of a teacher is more essential than this. He must first, last, and always be master of the situation. In dealing with students his should always be an attitude of unyielding firmness exercised in a spirit of justice and fair play. He should love his students and sympathize with them, and in order to achieve this he should fully understand them. To assert complete mastery he must be ever alert to check disorder. In school discipline, as in all other affairs of life, "An ounce of prevention is better than a pound of cure." The best disciplinarian is one in whose classes questions of discipline seldom occur by reason of the skill and good judgment with which he directs and controls.

In the second place, the teacher must be master of his subject. This will be indicated by his reputation as a workman, by the trade-analysis charts which he displays on the walls of his shop, by the trade literature that he reads, and by the standards of craftsmanship which he exemplifies in his demonstrations and which he requires of his students.

The successful teacher must, above all, be master of himself. He must exercise self-discipline by discovering and overcoming his weaknesses and peculiarities, as we have already mentioned. In all situations, no matter how exasperating, "He that ruleth his own spirit is better than he that taketh a city." The teacher should always respect the feelings of

his students and in dealing with them should always practice the golden rule. Remember that every student has certain rights that all teachers are bound to respect.

The attitude of the teacher should invariably be positive, not negative; always seeking the good of his pupils and striving unselfishly to promote their welfare. His influence should be stimulating, always radiating good cheer and encouragement.

The Teacher's Compensation

No man ever amassed a fortune out of his salary as a teacher. A comfortable living is the most that he can expect. Teachers' salaries are by no means commensurate with the talent and service required of them. There are, however, some compensations that do not come with the salary check. One is the respect of the community. To be chosen for a position as a teacher, one must be characterized by moral and social qualities of a high order. His work is acknowledged as indispensable for the welfare of society, and the community in its recognition of him will inevitably tender the tribute of respect due to one whose greatness comes from service to his fellows.

The man who comes out of industrial environment into teaching will soon appreciate the stimulus that comes from professional fellowship. The frequent conferences and conventions, in which mutual problems are discussed, each person contributing freely out of his experience and judgment for the benefit of all; and the nobler plane upon which these discussions are carried on, as contrasted with the petty, combative transactions too often characterizing gatherings of workingmen — these are satisfying compensations for the trade-teacher and make his position preferable to that of the mechanic.

Finally, when the teacher meets his former students who have gone out into the world and prospered, and they express to him their sincere appreciation of his instruction as one of the vital factors contributing to their success, then he feels that in his work he has made an investment in human character that yields the most satisfying returns, that brings back to him in later years the deepest gratification for the human soul — the consciousness of having helped others to achieve success in life.

WHY SHOULD I TEACH

CLARA LOUISE DENTLER[1]

"Why should I teach?" I ask. "Is it for gold —
That shining, glistening gold which men since time
Began have loved, then cursed, have hoarded to
Their bosom, ere long finding it an asp
Envenomed, bringing only torturing death?
For gold, just gold?" My soul makes answer, "Nay!
For that alone, the price is far too great.
Thy recompense in coin cannot be named
Because its substance is a finer thing,
Enduring when the visible has passed."
"Speak on, my soul," I said, "and tell me what
The teacher's recompense." Thus spake my soul:
"In service only comes the great reward,
Soul-satisfying, bringing happiness;
Today, this comes to him who hears the call
To teach the youth, to mold the tender lives
Who are our country's citizens tomorrow,
To teach, to watch development of mind,
But lovelier far, watch character unfold
Beneath the magic touch of sympathy —

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This rich reward awaits him who would teach."
"Oh, let me teach," I cried, "let all that's best
Within my heart and mind be dedicated
To this, the grandest, noblest work of life!
Because I am a patriot, it is
A duty to my country that I owe;
Because I love my God, I'll heed the call
To teach and serve God's humanity."

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DEAN. Just between Ourselves. Manual Arts Press, Peoria, Ill.
JAMES. Talks to Teachers. Henry Holt and Company, New York.

UNIT FIVE

PRACTICE–TEACHING

With the foundation laid down in the preceding units, teachers-in-training should now do some real teaching in order to obtain the experience necessary for studying with maximum profit the succeeding units on shop organization and student analysis. An ideal arrangement would be to have the first four units covered during the first year of the training-course, to devote the second year to practice-teaching, then to cover the remaining units during the third year.

Practice-teaching has been one of the difficult features to provide satisfactorily. The experiment has been tried of placing the men of the training-class in various evening trade-classes as voluntary assistants to the regular teachers, rotating or shifting them about in order to distribute their experience over several different schools and classes.

The regular teachers usually responded with outward cordiality to the offer of assistance and gave the teacher-in-training every possible facility and opportunity to try his hand at the teaching game, sometimes even assigning to him a small group of students. The regular teacher was usually, however, too busy to give the neophyte teacher much attention and suggestion. Trade-teachers already in the schools represented the older type who were plucked from the trade and thrust into teaching-positions without training and with no pedagogical foundation. They had not learned to work out lesson plans, and they were not competent to criticize the apprentice

teacher according to pedagogical principles or to offer much constructive suggestion. As graduates of the school of "hard knocks," there was among them an undercurrent of cynical attitude toward the new teacher-training scheme in spite of their outward professions of cordiality; or else they were overconfident in a few notions growing out of their teaching-experience, but not conforming with the best principles of pedagogy.

Yet another difficulty lay in the fact that the students in the classes soon discovered that the new assistant was a teacher-in-training who was "practicing" upon them. This they resented in every polite manner and disregarded the neophyte by carrying all their requests for instruction to their regular teacher, or else they dropped out of the class entirely.

Nor was the problem solved of supervising these men during their practice-teaching unit. It was difficult to get from them, under the circumstances, the desired preparation of lesson plans in advance, or satisfactory reports of their work afterwards.

Because of these conditions — namely, the voluntary character of service, the brief period of trial in any one class, the incompetence of many trade-teachers to supervise properly a beginning teacher, the resentment of students, and the difficulty in directing this practice-teaching program — it was found necessary to put this work on a more substantial basis. Accordingly the agents in charge of the training-class presented the situation to the directors of the various schools having evening trade classes, with the request that regular appointments in these classes be given to as many men as possible from the training-classes who had completed the first year's work. While the new teachers might in many cases

be employed as assistants, their employment was regular with compensation, and subject to official regulations.

This arrangement has given better results. Being assigned to a regular teaching-position with pay makes it possible to secure a more satisfactory response from the teachers-in-training in the way of working out lesson plans and reports; it makes the supervision of their work more feasible; it removes the resentment of students, because they will not so readily discover that their instructor is under special supervision, nor will they be able to evade him and recognize another teacher. The matter of immediate supervision can be placed with the director of the school in conjunction with the head teacher of the department, both of whom should receive from the state department definite commission and fee for their service.

During the season all the men engaged in the practice-teaching capacity should occasionally meet with the supervisor of the state department at some convenient place. This would make possible the development of a wholesome morale among the group, as well as some specific suggestions, answering questions relative to the work, difficulties encountered, etc.

Some more definite syllabus for this unit must be worked out for the instruction and guidance of all concerned. There must eventually be established, in each state where trade-teacher-training work is carried on, one or more institutions with ample facilities for the practice-teaching, similar to that in the normal schools for elementary-school teachers.

UNIT SIX

SCHOOL-SHOP ORGANIZATION AND MANAGEMENT

Experience has shown that the work of this unit can best be performed after the teacher-in-training has had some actual experience in teaching in a school shop. The experience of the practice-teaching unit will serve as the desired prerequisite.

This unit logically divides into two parts:

Part One consists of the organization of a school shop according to the case method; that is, you will select some particular shop, study all its conditions and limitations, then proceed to select the equipment, write specifications, and provide for the care and efficient use of it. You will also write requisitions for the necessary supplies for conducting the projected work, plan suitable means for keeping these supplies in stock, and write inventories of equipment and supplies.

In Part Two you will take a job or project to be produced in this shop, analyze the job into its various operations, and arrange these in an instruction order; you will prepare written job orders for this project and write orders for the necessary materials; finally, you will plan out methods of assigning and checking both the jobs and the students performing them.

Part One. Organizing the School Shop

Assignment 1. Select some school shop with which you are familiar. If you are teaching in any shop, take that one. Do not attempt to plan out some ideal or hypothetical shop—

you will never find such a one to work in, anyway. The shop-teacher must take what is available and make the best of it, no matter how unsatisfactory it will be. The shop room must usually be accepted as found. Sometimes alterations more or less extensive are possible, but there are usually limitations to this.

Having selected your shop, study the situation carefully with reference to the following list of standards.

STANDARDS FOR A SCHOOL SHOP

1. *Floor space* should be from 1500 to 3000 square feet (this will vary with the subject or trade).

2. *Window light* should be on two sides if possible, also supplemented by skylights wherever possible. Window-glass area should be at least one fourth of the floor area.

3. *Electric lighting* should equal 100 to 125 watts per square foot of floor space. Indirect lighting is best, particularly for drawing-rooms. Drop lights should be installed for each machine. Switches and fuse boxes should be readily accessible.

4. *Floors* should be strong enough for the proposed load. Distinguish between concentrated and distributed load. Get data from engineers' and builders' handbooks. Be sure that ceiling beams are strong enough to carry overhead shafting if desired.

Surface of floors should be wood where edge tools are to be used. Avoid bare concrete floors wherever possible. The use of wood paving blocks for shop floors is not altogether satisfactory.

5. *Walls.* Brick, unplastered, is desirable for exterior walls; tile or light frame for interior walls or partitions. Paint with dark color five feet above floor; above this, on walls and ceilings, paint with mill white, flat or dull gloss.

6. *Ceilings.* Minimum height, 12 feet. Higher ceilings are desirable for carpentry, electric wiring, or plumbing, or for special machinery, such as cylinder printing-presses with feeders etc.

7. *Heating and ventilation.* Provide for temperature of 60 to 65 degrees in shops and 70 degrees in drafting-rooms and classrooms. Volume of room should be at least 250 cubic feet per person.

8. *Stock, tool, and supply rooms* should be adequate to contain full-size materials. Separate drying-rooms, glue-rooms, and staining-rooms (or finishing-rooms) are desirable in connection with woodworking shops.

9. *Power intake* should be convenient and adequate.

10. *Plumbing.* Toilet and wash-room facilities should be accessible to all shops. Provide at least one water closet for each fifteen students, one urinal for each fifteen boys, and at least four lavatories and one drinking-fountain for each shop.

11. *Cabinets and storage facilities* should be adequate for all supplies, finished work, students' clothing, etc.

12. *Blackboard.* Each shop should have at least 80 square feet of blackboard space.

13. *Benches and fittings* should be full-size, with full-width vises etc., as in a commercial shop.

14. *General tools and machinery* should be commercial tools of average capacity and should represent the industry of the community.

15. *Individual tools.* Provide one set of necessary tools for each student. Special tools should be kept in the tool room.

16. *A first-aid cabinet* should be readily accessible and contain sterilized dressings for cuts and wounds and other first-aid apparatus.

17. *Entrances and exits* should be large enough for proposed machines, furniture, and supplies.

Assignment 2. Make a drawing of the floor plan of your shop. A scale of $\frac{1}{4}''$ to the foot is convenient. Show all windows and doors. Be sure to give the width of the doorways. Show sufficient adjacent rooms, corridors, etc. to indicate the approach and entrance to the shop, the route to the office, toilet, stock rooms, etc. Show location of electric lights, power intake, etc., using standard conventions.

Assignment 3. Prepare a tentative list of the proposed machine equipment and furniture for your shop (groups *A* and *B* in classification given below).

This list should be introduced by a statement setting forth specifically the purpose and limitations, in some such form as follows:

The following is a tentative list of equipment for the proposed _____ shop in _____ school, to cost not over _____ dollars, to accommodate _____ students at a time and to be arranged in the room as shown on accompanying drawing.

It will be found convenient to list the equipment under a few general headings, such as the following:

CLASSIFICATION OF EQUIPMENT

A. Machine equipment, including the large machines or furniture requiring floor space.

B. Individual tools, including the tools that are to be furnished in sufficient number so that there will be one for each student.

C. General and special tools which will be for common use and kept in the tool room or special cabinet.

D. Furniture and fixtures, such as storage cabinets, benches, tables, desks, etc.

Opposite each item write the probable cost.

In choosing equipment the following points should be kept in mind:

1. *Funds available.* "The garment must be cut according to the cloth."

2. *Purpose or character of instruction.* The equipment must be suited to the purpose for which it is desired; that is, vocational school, trade school, technical school, technical high school, junior high school, or manual-training school.

3. *Size of class.* The number of students will determine the number of individual tools required.

4. *Room to be used.* Physical conditions, dimensions, etc. are important considerations.

Secure catalogues of tools and materials for the line in which you are interested. See advertisements of school-shop equipment in *Industrial Education Magazine*, *Industrial Arts Magazine*, and in the different periodicals representing your trade.

Assignment 4. On a piece of heavy cardboard draw the floor size of each item listed in the previous assignment, using the same scale as for the floor plan. Indicate position of cone pullies, motors, etc. Cut out each piece and place on the room plan, trying out one position after another until the most satisfactory arrangement has been secured, then trace the outline of the pieces on the plan. Write in the name and size of each item.

In studying the arrangement bear in mind the following points:

1. Accessibility of various machines, or units.
2. Light on work.
3. Routing of work.
4. Source and distribution of power.
5. Entrance and exit of students.
6. Control of students.

Assignment 5. Prepare a tentative list of the remainder of the necessary equipment classified under (1) individual equipment and (2) general equipment, giving the estimated cost for each item.

Assignment 6. Write a summary of the estimated cost of equipment for the different classes already listed and additional items, as follows:

SUMMARY OF COST

Machine equipment	$
Individual tools	
General tools	
Furniture	
Installation	
Miscellaneous	
Total	$

NOTE. It is well to have a considerable miscellaneous fund, for in putting a shop into service many small items will be needed that have not been anticipated.

Assignment 7. Having received criticism of your proposed list of equipment, as submitted in Assignments 3 and 5, now write out this revised list in complete specification form, following the suggestions given below.

In writing orders for equipment or supplies, the writer should be so definite and explicit that it will be impossible to mistake any of his details. The range and variety of shop equipment are now so great that extreme care must be taken to specify every detail in order to avoid substitutes or misunderstandings.

Some general points to be considered are as follows:

1. State where the goods are to be delivered. Specify the building (street and number); for large equipment the room where it is to be placed should also be mentioned.

2. If carriage is to be prepaid by the shipper, this should be specified.

3. If equipment is to be installed by the manufacturer or dealer, it should be explicitly specified and accompanied by plans showing the location.

4. For large machines give the maker's name, the type or number, the size, the capacity, the attachments, etc. If you

are writing the specifications from the dealer's quotation, be sure that no omission, joker, or loophole gets past you.

5. For small tools or materials give for each item the number or quantity wanted, the general name of the tool (capitalized), the manufacturer, the catalogue number, the size, and all details necessary to distinguish the article desired from any similar article. For example,

Three	Firmer Gouges, Buck Bros. tanged, $\frac{3}{4}''$, outside bevel, regular sweep, handled and sharpened ready for use, @ 75 cents	$2.25

6. Write the quantity or number of items wanted in the first column, the description in the next, and the total price in the last column (write the price per unit in the description column). Do not overlap the columns.

7. Within each large group of items, arrange the items with the names of articles in alphabetical order. Arrange also in sequence of sizes, usually beginning with the smallest.

8. Be sure to make each size a separate item.

Assignment 8. Write a classified list of supplies needed for your shop for one year, keeping within a fixed cost limit.

Assignment 9. Prepare a suitable form for ordering these supplies.

Assignment 10. Prepare a progressive inventory form to show all withdrawals and balances for supplies. Post in one group of supplies to show the working of the form.

By supplies is meant the materials which are consumed, the quantity of which thus diminishes and must be replenished from time to time.

Suggested classification of supplies. In machine shop: steel stock, small tools, hardware, general; in woodworking: lumber,

paints and oils, hardware, general; in electric wiring: fixtures, wire, general; in drafting: paper, ink, pencils, general; in auto-mechanics: tools, electrical supplies, hardware, oils and grease, general; in plumbing: lead pipe, rigid pipe and fittings, general; in printing: paper, ink, type, general.

Quantity of supplies needed. Estimate on basis of per capita per time unit.

Ordering supplies. This may be done by either of two methods: (1) hand-to-mouth (most expensive); (2) budget (most economical).

In ordering, use standard requisition forms showing all necessary data.

Keep a duplicate copy of all requisitions.

Check the goods received against the requisition.

Keep the main stock in reserve. Record all withdrawals for daily or weekly use or for special jobs, and enter the quantity left on hand. This makes a progressive inventory form.

Assignment 11. Explain in detail your scheme for arranging, storing, assigning, and checking up the tools in your shop. Show sketches of individual tool trays, check boards, drawers containing supplies. (Isometric or cabinet sketches may be used wherever feasible).

Note special provision for care of oils, waste, and other supplies involving fire hazard.

Assignment 12. Prepare a card record for each machine listed in Assignment 3, showing the name of the machine, the selling agent's name and address, the manufacturer's serial number, your shop record number, the cost, the date ordered, your order number, the date installed, the department, the complete specification, including capacity, attachments, etc.

Assignment 13. Prepare an annual inventory form for small equipment and supplies.

Study the specimen inventory form on page 146.

VOCATIONAL SCHOOL INVENTORY

The principal is requested to fill in below a complete inventory, including supplies and equipment etc., under proper headings

ITEM	On Hand June 30, 192	Received during Year	On Hand June 30, 192	Required for Delivery

Part Two. Operating the School Shop

Assignment 14. Select some project suitable for production in the shop which you have now organized.

Suggestions for machinists: a small grinder, a speed lathe, a vise, a drilling-machine, etc.

Suggestions for woodworkers: a pattern outfit for any of the machines mentioned above; also an order for tables, cabinets, benches, etc.

Suggestions for draftsmen: an assembly drawing for the machines mentioned, to be analyzed for detailing; a sketch and description for making the assembly drawing and details for benches, cabinets, etc.

Suggestions for electricians: an order with drawings and specifications for a typical electrical installation, such as a complete annunciator system for a ten-room hotel or office building, a complete installation of electric lights in an ordinary eight-room residence, or an installation of a motor in a shop.

Suggestions for plumbers: an installation of a hot-water system with a 30-gallon tank connected to the kitchen range.

Suggestions for automobile mechanics: Remove the old clutch and install a new one in an automobile.

Suggestions for printers: print a 32-page catalogue with cover.

For the job selected secure complete drawings or copy, and all data necessary for attempting the job.

It is the purpose of the remaining work of this unit to show how the project which you have chosen may be executed in the school shop by analyzing it into its elements and arranging these elements in an instruction order according to the trade analysis which you worked out in Unit Three.

Assignment 15. Make a job-analysis chart showing the parts of the project written out in the first column and the operations to be performed on each part written opposite, in the column headed by the block of the trade in which the operation belongs. Also indicate the checking-level within the block at which the operation comes.

Write out the operation in the form of a working-direction ; for example, for a loose pulley, there may be written in the column for bench work the following : " Locate oil holes and set-screw holes and indicate them for drilling."

Every operation necessary for completing the project is to be written out in this manner in its proper column.

Assignment 16. Prepare a form for job orders upon which shall be written the direction for performing the operation, as explained in the preceding assignment. This direction then constitutes a job order. There should also be indicated the project to which the operation or job belongs, the name of the part of the project or machine, the drawing-number (so that the drawing of it can readily be secured), the block or unit of the trade to which it belongs, also the checking-level within the block. There should also be blanks for filling in the name of the student to whom the job is finally assigned, the date begun, the date completed, the working-time, the rating, and any supplementary remarks.

A convenient form for such a job order is a sheet that can be folded and written in duplicate by using carbon paper. A convenient size is 4×6 to fit a standard filing drawer. All operations written out on the analysis chart should be written off on the job-order sheets and these orders classified before beginning work on them in the shop.

Assignment 17. Prepare a card-index file for job orders. This may be regarded as a reservoir file. Use 4×6 size,

with tabs cut thirds. Take one card with left-hand tab for each block in your trade, and print in the name of the block. (These cards should all be of one color.) For each of these block indexes take as many cards (of another color) with middle and right tabs, each divided into two, as you have checking-levels within the block and number them 1, 2, 3, etc., and place behind the block index.

The file is now ready for the job orders which were written out in the previous assignment.

From the job orders in this file may be selected at any time an assignment to suit a student in any stage of learning, provided there be a sufficient variety of projects under way.

When projects are put through in quantity, as ten lathes or thirty tables, the assignments may be divided or split up, in order to distribute the experience (opportunity for learning) among as many students as may seem feasible. For example, one student may in assembling six tables secure a maximum of learning-profit. Therefore, in putting through a job of thirty tables, five different job orders may be written, each reading the same (assemble six tables), thus distributing this phase of the project (thirty tables) among five students.

Assignment 18. Prepare a file for job orders classified by projects. Let the left-hand tab (one color) indicate the project, and the middle and right tabs (another color) indicate the parts of the project. Whenever a job is assigned to a student, file one sheet of the job order in its proper place in the job-order file and the other in the student's file.

The first supplementary index card under each project may be reserved for assigned jobs which will be put in the parts' file only when the job is completed. This file may be shown by isometric or cabinet drawing, with complete explanation of the working of it in lieu of the actual cards. (See Fig. 7.)

Assignment 19. Prepare a file for job orders classified by students. Assign to each student one index card, arranging in alphabetical order. File job orders as indicated in Assignment 17. Provide some means of distinguishing between assigned and completed jobs. This file, like the previous

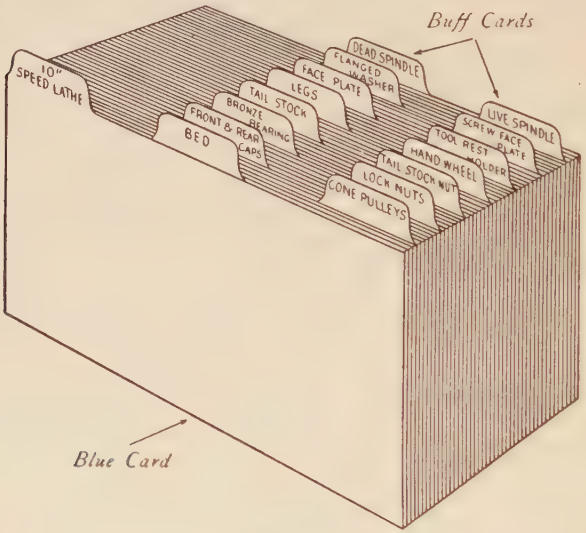

FIG. 7

one, may be shown by a sketch and detailed explanation instead of using actual cards. See Fig. 8.

Assignment 20. Prepare a student's progress chart. This should show in graphic form the achievement of each student, and should be kept up to date. It should be posted in a conspicuous place on the wall of the shop where it is always accessible to every student so that he can note his progress, both with reference to the course and with reference to other students. The advantages of such a chart are (1) that it stimulates the student's ambition; (2) that it conserves his time by

avoiding repetition of work that he has already performed and for which he has received credit; and (3) that it thus prevents exploiting the good student by imposing upon him too much rush job work that has little or no instruction value.

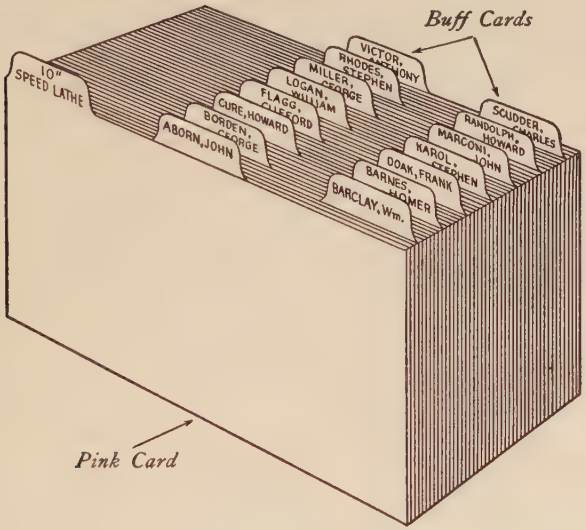

FIG. 8

Show the names of the students in the first vertical column. Let the other columns show the trade blocks and their subdivisions into type jobs. If it is not feasible to write out the complete description of the type job at the head of the column, the serial number of the job may be indicated, and the description or specification written out in full on another sheet to be posted by the side of the chart, so that one can readily determine what type of job is indicated by the number at the head of any column on the chart. Whenever a student completes a job in the shop, the space on the chart opposite his name and under the type to which his job

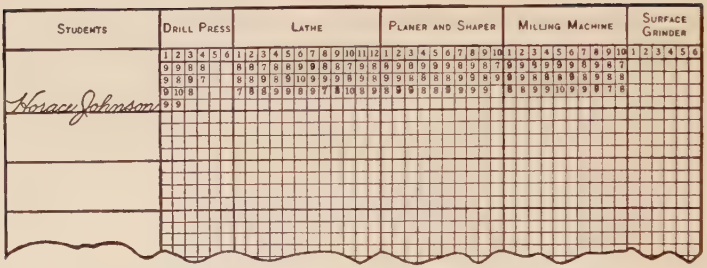

Fig. 9A. Student's progress chart [1]

belongs should be filled in. The following are some of the methods used in various places for making such entry:

1. The space is filled in solid with a colored pencil or colored ink. Bright colors are preferable. The succession of spaces thus filled in eventually forms a bar graph.

2. The space is marked X, preferably in color.

3. The outline of the space is drawn with colored pencil, leaving the inner area for noting date and rating.

4. The space may be divided into three or four divisions, thus providing for a number of repetitions of the type job for the sake of drill, each division being registered in some manner when a job of that type is completed.

Whenever the space is registered or filled in, it indicates that the student has performed the type of job indicated by that space, and he should not be required to repeat that type of job without a good reason therefor. Let it be understood and emphasized in every way possible that the purpose of a school shop is to secure the progress of the student through the series of type jobs comprising the trade which that student is learning.

[1] *Ratings.* The light-face type may be indicated in blue ink or crayon to represent the whole numbers. The heavy-face type may be indicated in red ink or crayon to indicate whole numbers plus 5.

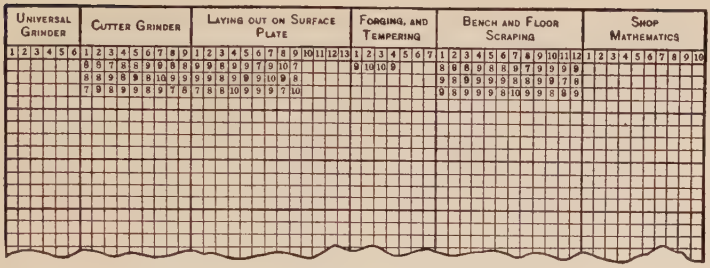

Fig. 9B. Student's progress chart [1]

The specific advantages of this chart are as follows:

1. It is a class record that can be kept up with a minimum of clerical labor by the instructor.

2. The record is public and readily intelligible by all — fellow students, parents, employers, school officials, or anybody interested.

3. The record shows at a glance just how much has been accomplished by each student and how much still remains to be done to complete his course.

4. The student will work more zealously to complete the course unit by unit, because the attainment of the unit is an objective near at hand and thus more stimulating to effort than the more remote end of the complete course, and he is anxious to see the unit spaces of the chart filled in one by one.

Assignment 21. Prepare a project-progress chart. Even though the practical job work in the school is a means, a subordinate or secondary matter, it should be conducted with system and according to principles of efficiency. While the time element is not of primary consequence, yet a project once attempted should ultimately be completed, and during its progress it should be carefully accounted for.

[1] See footnote on opposite page.

A job-progress chart may be similar to the job-analysis chart prepared in Assignment 8. Instead of having the complete description of the operation written out, the space for that operation may be smaller, outlined with a heavy line or a colored line to indicate the operation, and as each operation is completed, the space may be posted in some manner similar to that used in the student's progress chart. Thus it will always be readily apparent what operations have been completed and what operations remain to be performed in order to complete the project.

Many valuable suggestions for these charts may be obtained from studying the charts and graphic methods used by engineers.

Assignment 22. Prepare a daily plan-book to show the work to be done on the following session by each student.

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UNIT SEVEN

PSYCHOLOGY APPLIED TO STUDENT ANALYSIS

In the preceding units we have attempted to analyze three phases of the teaching-job: namely, analysis of subject matter (what to teach), in the unit on Trade Analysis; analysis of teaching-methods (how to teach), in the unit on Principles of Teaching; and analysis of teaching-facilities (with what to teach), in the unit on Shop Organization and Management. No less important is it that teachers should be able to understand by some sort of analysis the mental capacities and reactions of the students whom they teach. In other words, the teacher must teach the student as well as the subject. The logical manner for pursuing this topic is to study the science dealing with human behavior (psychology), with particular reference to its application to the teaching of trade work.

This unit is outlined as follows:

I. The Value of Psychology to the Shop-Teacher
II. Native Capacity of Students
III. Sense Perception applied to Shop Work
IV. Trade Habits and Trade Judgment
V. Human Motives and Interest
VI. Rating Students in Shop Work
VII. Shop Discipline

This topic is approached from the standpoint of the fundamental human instincts and motives, in an endeavor to enable shop-teachers to diagnose the behavior of their students and

to control the situations within their classes in such ways as to produce the desired responses.

A list of books that have been consulted in the preparation of this course is given in connection with each lesson, but it is not expected that teachers-in-training will do much reading in psychology for some time to come. The type of books that would be profitable for them to read have probably not yet been produced, nor is much reading desirable at this stage. The teacher should learn to observe human behavior, thereby to discover for himself the underlying principles of conduct, rather than to be carried away by any of the numerous pseudo-psychologic systems that are now on the market. This kind of exercise will have the additional disciplinary value of sharpening his own powers of observation, perception, and discrimination. No man can describe a thing any more clearly than he sees it himself; and the teacher who would lead his students to observe and perceive all details or elements in a situation must himself have superior powers of perception, analysis, and judgment.

I. The Value of Psychology to the Shop-Teacher

Psychology, the science of human behavior, was formerly regarded as a mystery to be understood only by a few fortunate initiates. The term has long been, and is still, used as a means of quackery and exploitation by the hypnotist, the clairvoyant, the phrenologist, the character analyst, and others who attempt such things as mind-reading, telepathy, communication with the dead, etc. The word is also carelessly used in frequent references to the "psychology" of this or that situation.

It is our purpose here to divest the word of its mystery and glamour, to redeem its bad reputation, and to consider as far

as possible in a common-sense and practical manner the contribution which the science of psychology can now offer to the work of trade instruction.

Some twenty-five or thirty years ago, in our colleges and normal schools, attention began to be given to the importance of mental science for school-teachers generally, and psychology has now become the foundation of modern educational science; but in the very recent efforts at training teachers of shop work, little heed has yet been given to the subject. The reasons for this are, first, that there has not been time for it in the intensive short courses (usually evening work) provided for trade-teachers; and, second, that the subject has been regarded as too academic or "highbrow" to be of practical use. During the last ten years, however, the methods of psychological study have been revolutionized, and its contributions to various fields of human activity have become of large practical value. In advertising, in salesmanship, in employment management, in welfare work generally, the importance of understanding the reactions of the human mind is being recognized today as never before.

The teacher of shop work may be a workman possessing the highest degree of mechanical skill, and he may be given the very best of tools and equipment; but if he cannot understand the mental capacities and attitudes of his students, he fails at a critical point in teaching.

This analysis of students is just as simple and practical as the analysis of the trade, and may be started in the same manner; namely, by trying to recognize the constants and variables in human behavior, by grouping together the qualities which have common elements, and by arranging these groups in an order that will give the best meaning or the greatest convenience in treatment.

Take together all the students that a shop-teacher has to handle — his class of boys from fourteen to sixteen years old in the day school, and his group of men from eighteen to thirty-five years old who come to the evening classes. Now these persons are all alike in many respects: they are all of the same sex; they all communicate their ideas in the same language (at least in school); they all eat, drink, breathe, sleep, work, rest, enjoy amusement, have their likes and dislikes, their favorites and prejudices, etc. The fact that they all come under the teacher's instruction indicates another common interest; namely, their desire to learn the particular subject which he teaches. They each have, also, both a motive for learning and a capacity to learn; and in further analysis of the process of learning we have seen that they all learn in much the same manner. They all have the same special senses: they see, hear, feel, smell, taste. These sense impressions are conveyed to the brain and interpreted into concepts, ideas, motor reaction, etc. in the same manner for each person.

Therefore the first principle of psychology for us to recognize is *the principle of uniformity or normality*; that is, *each individual of either sex is built upon the same identical plan, both physically and mentally*. The person manifesting any marked deviation from this plan is regarded as abnormal. If he has an unusually large head or disproportionately short legs, he is abnormal physically; if he repeatedly fails to regard the life or property rights of others in any particular respect, or if he is unable to exercise the general judgment and behavior shown by his fellows in the ordinary situations of life, he is abnormal mentally. He may also possess particular abnormal powers, such as memorizing names, dates, long series of numbers, etc. Abnormality may be shown in excessive

ability or power as well as in deficiency in any respect. Just as the practice of medicine has become an exact science through the more accurate knowledge of the uniform and normal structure and functions of the human body, so psychology has recently assumed the rank of an exact science through its discoveries of the laws of action of the human mental and nervous system, which are uniform for all normal individuals.

Even though all individuals are built on the same physical and mental plan, there is, nevertheless, a wide degree of variation among men. If all persons were alike, there would be no individuality, no means of distinguishing one man from another. We therefore recognize, as a second psychological principle, *the fact of variation*; that is, *individuals differ in the strength of their capacities, tendencies, or impulses*, just as they vary in the shape, size, color, etc. of various parts of the body. Some of this variation is due to heredity — the characteristics which have been transmitted down to the individual from his ancestors; and some of it depends upon his environment — the influences since birth that have molded and shaped his character. Individuals differ also according to age, sex, climate, and in a multitude of other ways.

Note that the variation is due *not to different traits*, for all individuals possess practically the same capacities and tendencies — that is, every man has some disposition to acquire possessions, to fight, to construct, or to coöperate with his fellow men; he has some ability to use numbers in counting and calculating, or to perform certain muscular exertions, but this ability is not the same for all individuals. The variation lies in the *strength* of these capacities. What is one man's strong point may be another's weak point. The welfare of society requires that in some cases individuals unusually

deficient in essential characteristics shall strengthen these deficiencies through training ; as, for example, the propensity to disregard thrift, cleanliness, order, etc. In other cases the strong points should be sought out and made to serve both the individual and society ; as, in the event of war, there is both need and opportunity for the employment of any special ability or talent all the way from financiering, from engineering, from military organization, or from industrial organization down to the repetitive operation of the semiautomatic machine that daily turns out thousands of pieces exactly alike but necessary for success in the national crisis. Each man should do that which he can do best. This principle, which has been so conspicuously exemplified in the recent war, is no less true under normal or peace-time conditions.

The principle of variation is of utmost significance to the teacher. Not only must he understand the constants of human nature : the instincts, sense organs, age periods, etc. of students, but he must also recognize the human variables : he must discover and identify the particular interests, motives, capacities, and aptitudes of each student. All students cannot be treated alike. Their variations are as important as their uniformities — in some respects even more important, because disciplinary troubles in school frequently arise from failure on the part of the instructor to recognize and properly treat individual peculiarities.

Two patients in adjacent rooms in a hospital may have the same disease, yet each may be given different treatment by the physician on account of difference in age, constitution, and other factors in their respective cases. Two students in the same class may commit the same offense, yet each may be treated differently by the wise teacher, who recognizes that the actions result from different motives or stimuli, or that a

different kind of appeal will be required to secure the desired reaction from the respective cases. One man may be assigned a certain set of exercises or diet by his physical director, while another will be given an entirely different prescription, but the aim in both cases is to secure the maximum physical well-being of both men. The study and shop practice assigned to students will vary according to their individual differences, but the purpose is in each case to develop the highest degree of trade skill that each student is capable of acquiring. Likewise, in the moral qualities each student should be given social exercise that will strengthen his weak or unsatisfactory traits of character and develop habits of conduct that will be for his own welfare and for that of his social group as well.

Recent psychological studies have disclosed some interesting facts relative to the distribution of ability among human beings. Tests and scales for measuring human intelligence have been constructed and applied to large numbers of individuals, and the number of persons found at the various intelligence stages has been plotted out. The result of one such study is shown in Fig. 10. The horizontal base line represents an intelligence scale divided into two hundred points. The number of points in this scale which any individual scores in the tests compared with the score for a normal individual of the same chronological age is his intelligence quotient (I. Q.). The various panels represent proportionately the percentage of persons scoring at each stage. It is interesting to note that the number of persons of inferior intelligence (subnormal, or below 85 points) about equals those of superior ability (supernormal, or above 115 points), but the number of intermediate ability (normal, or between 85 and 115 points), totaling 77 per cent of all individuals, far exceeds both extremes. This distribution follows the normal probability curve

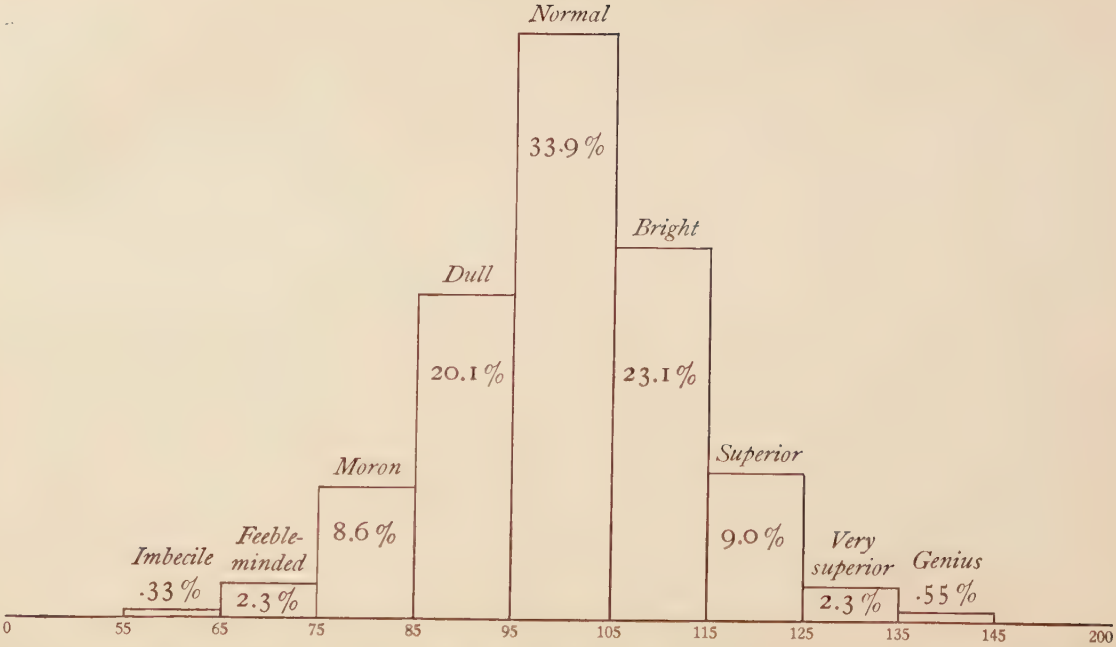

FIG. 10. Distribution of intelligence quotients of 905 pupils (Terman), representing approximately normal distribution of ability among human beings

of mathematics (Fig. 11), which shows the frequency with which any form or event is likely to occur.

In every class will be found some individuals of exceptional ability, also a few of lesser ability. The latter cause the instructor the more concern, perplexity, and annoyance. He should, however, not overlook the relative proportion of these delinquents; he should remember that they are matched by about the same number of exceptionally able students, but that the greater number of the group are of average or normal ability, and for them the instruction should be planned.

FIG. 11

The third psychological principle for us to recognize is that *every muscular action is stimulated by a nervous process*. For the better understanding of this principle a brief description is here given of the physiological foundation of psychology.

The whole nervous system is a combination of millions of nerve units called *neurones*, each resembling a telephone line, at one end of which a message is started, to be received and interpreted at the other end. In psychology the starting of the message is called a *stimulus*, and the effect at the receiving end is called a *response*. The central office, or main exchange, of this marvelously complicated system is located in the part of the body known as the brain. A stimulus may originate in the terminals of the neurones in the sense organs and be transmitted to the brain, or it may originate in the brain in the form of an idea and be transmitted to the desired neurone terminal, to result in muscular or other action.

The neurones concerned in the behavior of a single man probably exceed in number by a thousand-fold all the telephone lines in the world, and a description of the details of their arrangement, if such were known, would be an almost endless task. . . .

The varieties of connections which appear in the case of the instincts of multiform mental and physical activity, curiosity, manipulation, visual exploration, and vocalization, and in the millions of habits which develop from these instincts, have a fit mechanism in this very sensitive, very complex, and very modifiable switchboard arrangement of man's neurones.[1]

From the foregoing discussion it follows that *skill in teaching consists in understanding and applying the laws of mental operation.* This is particularly true in shop work, where the aim is to secure certain desired manual performance on the part of students. The skilled teacher will know how to excite the nervous stimulation necessary to secure the desired muscular action. There are many so-called natural-born teachers —that is, persons who instinctively or intuitively make a good presentation or appeal to their students; but every such natural teacher will make his instruction the more effective by studying the laws of mental action. He should understand the mental processes involved in acquiring acts of skill (laws of habit), in associating and recalling desired ideas (laws of memory etc.). He should also be able to understand the interests and motives which control the student's actions, and present his instruction in conformity thereto.

The research now being made by psychologists in the fields of trade tests and vocational guidance are founded upon the three psychological principles already stated; namely, the uniform plan of structure of the human body and the nervous system, the variation in strength of capacities and traits,

[1] Thorndike, Educational Psychology, Briefer Course, chap. vii.

and the fundamental action of stimulus and response in the nervous system. The results from this research and experimentation promise much of definite help to teachers of manual subjects, and every shop-work instructor should keep in touch as far as possible with the progress of this phase of educational activity.

PSYCHOLOGICAL TERMS

Psychology as a science must be truthful and accurate. Furthermore, it is the purpose of this discussion to enable the trade-teacher to analyze the behavior of his students with some degree of accuracy and to employ correct terms in such analysis. It is therefore desirable, as a foundation for further consideration of the subject, to state the meaning of some of the more important psychological terms as they are used by the leading psychologists at the present time and as they should be used in attempting to describe other men, either employees or students.

Aptitude. The tendency of an individual to learn a particular subject or to acquire skill in any particular line. This tendency may depend upon either heredity or previous training.

Attitude. The character of one's mental reaction toward any person or situation.

Behavior. Used in the broadest sense to include man's response to impressions made upon him by objects, people, and events.

Capacity. Refers in a semiquantitative sense to native mental equipment, such as powers of sensation, perception, retention, attention, imagination, etc., and to the achievement resulting from training through the aid of these powers.

Characteristic. Any quality or trait by which a thing or individual is described.

Faculty. A term formerly applied to the divisions of native mental powers or agency, such as will, reasoning, instinct, etc.; or to more specific aptitudes, such as the faculty for singing, dancing, drawing, etc. This term is now practically obsolete among progressive psychologists.

Instinct. The tendency of an individual in the presence of a definite situation to act in a definite way because of inherited sets of connections in his nervous system. The response does not have to be learned; it is usually done unconsciously, and always in the same way by all normal individuals.

Intellect. Applied to the higher mental processes involving reason and judgment, as distinguished from mere sense perception, memory, etc.

Intelligence. The sum total of man's instincts and native mental capacities as developed by his experience.

Quality. A most general descriptive term applied to a thing or individual. There are many other qualities besides psychological qualities; for example, moral qualities, physical qualities, etc.

Reflex. The simplest form of instinctive muscular reaction to a stimulus, like closing the eyes when a bright light is suddenly turned on, or dodging a missile.

Thinking. Mental activity consciously directed toward the solution of a problem or attainment of an end. The word is often loosely used to imply any mental operation, such as sense perception, emotion, or reverie; but instinct, habit, or memory aid in many situations and make real or purposeful thinking unnecessary.

Trait. A quality or characteristic peculiar to an individual, distinguishing him from all others of his kind.

Temperament. The attitude of mind of an individual as affected by his physical conditions; as nervous, sanguine, choleric, or bilious temperament.

QUESTIONS AND PROBLEMS

1. By observing your fellow workers, make a list of the desirable qualities which a skilled workman in your trade should possess. Classify as moral, psychological, and physical qualities.

2. Classify some group of men in your trade into three groups, placing in group A the few who are regarded as superior workmen, in group C the few of lowest ability, leaving in group B the majority of average ability.

3. In what qualities are the A men especially strong?

4. In what qualities are the C men weak?

5. Which of these weak qualities are probably due to heredity and which to environment?

6. What means can you suggest for improving these weaknesses?

7. Why did the men in class A enter this trade?

8. Would any of them have become equally proficient as a physician, lawyer, engineer, sculptor, accountant, teacher, musician, or actor? Why?

9. Would any of the class C men probably have achieved greater success in some other trade or occupation? What line, and why?

10. Write out a list of the common criticisms expressed by mechanics relative to apprentice boys.

11. Which of these criticisms are just and which are unfair? Why?

12. Should a shop-teacher require of all students the same standard of proficiency? Why?

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II. Native Capacity of Students

One exploded theory of education is that the child's mind is a clean sheet upon which the teacher impresses his instruction. The child comes to the teacher even at kindergarten age with a considerable equipment of experience and learning

capacity. By the time he reaches the shop class — whether in manual training or industrial arts at ten years of age, the junior high school at twelve, or the trade or vocational shop at fourteen — he possesses abilities, traits, and habits which are more or less fixed and which constitute the foundation on which to build further instruction. Surely the teacher has considerably more than a clean sheet to begin with.

This learning equipment is of a twofold character: (1) the native endowment of reflexes, instincts, and capacities which the individual possesses at birth or develops naturally, and (2) his experiences since birth which have been interpreted into meaning by his native mental powers. It is the first of these phases that we shall discuss here.

The native endowment may be considered under three phases: first, instincts; second, mental capacity; and third, hereditary traits.

INSTINCTS

There are incorporated in the nervous system of every individual certain connections that result in a definite response whenever a given situation is presented. The simpler responses, such as withdrawing the hand from a hot object or dodging an automobile in the street, are called reflexes. The more deeply seated nervous connections resulting in more complex responses are the instincts proper. When a class of boys for the first time comes into a new shop, they all immediately proceed to inspect and manipulate the various machines and tools throughout the room. They do not have to be taught to do this. They go about it just as surely as a flock of chickens will rush to devour the handful of corn thrown down in their midst, and it will require considerable firmness on the part of the teacher to get the attention of this class until their

inquisitive instinct has been satisfied in the presence of this new situation. It may be a mark of wisdom on the part of this teacher to let these boys wander around the shop for a little while before attempting to suppress their curiosity.

The list of fundamental instincts has by no means yet been agreed upon by psychologists. Thorndike[1] gives a list of forty-two different types of instinctive reactions, as follows:

I. FOOD-GETTING AND PROTECTIVE RESPONSES

1. Eating
2. Reaching, grasping, and putting objects into the mouth
3. Acquisition and possession
4. Hunting
5. Collecting and hoarding
6. Avoidance and repulsion
7. Rivalry and coöperation
8. Habitation
9. Response to confinement
10. Migration and domesticity
11. Fear
12. Fighting
13. Anger

II. RESPONSES TO BEHAVIOR OF OTHER HUMAN BEINGS

14. Motherly behavior
15. Gregariousness
16. Responses of attention to other human beings
17. Attention-getting
18. Responses to approving and to scornful behavior
19. Responses by approving and scornful behavior
20. Mastering and submissive behavior
21. Display
22. Shyness

[1] Educational Psychology.

23. Self-conscious behavior
24. Sex behavior
25. Secretiveness
26. Rivalry
27. Coöperation
28. Suggestibility and opposition
29. Envious and jealous behavior
30. Greed
31. Ownership
32. Kindliness
33. Teasing, tormenting, and bullying
34. Imitation

III. MINOR BODILY MOVEMENTS AND CEREBRAL CONNECTIONS

35. Vocalizations
36. Visual exploration
37. Manipulation
38. Cleanliness
39. Curiosity
40. Multiform mental activities
41. Multiform physical activities
42. Play

Warren[1] classifies the instincts under twenty-six headings, as follows:

I. NUTRITIVE

1. Metabolic expressions
2. Walking
3. Feeding
4. Wandering (hunting)
5. Acquiring (hoarding)
6. Cleanliness

II. REPRODUCTIVE

7. Mating (sexual attraction, courtship)
8. Maternal
9. Filial (of infancy)

[1] Human Psychology, p. 106.

III. DEFENSIVE

10. Flight
11. Subjection
12. Hiding
13. Avoiding
14. Modesty (shyness)
15. Clothing (covering)
16. Construction (home-making)

IV. AGGRESSIVE

17. Fighting
18. Resenting
19. Domineering
20. Rivalry

V. SOCIAL ORGANIZATION

21. Family (parental and filial)
22. Tribal (gregarious)
23. "Apopathetic"
24. Sympathetic
25. Antipathetic
26. Coöperative

Munson[1] names these twenty instinctive tendencies that he claims are generally recognized as basic:

1. Hunger and thirst
2. Fear
3. Repulsion
4. Pugnacity
5. Self-assertion
6. Self-submission
7. Rivalry
8. Curiosity
9. Gregariousness
10. Sympathy
11. Imitation
12. Acquisitiveness
13. Play
14. Constructiveness
15. The migratory instinct
16. The reproductive instinct
17. The parental instinct
18. The religious instinct
19. Rhythm
20. The comic

[1] The Management of Men, chaps. iv, v.

A most practical discussion of the subject by Ordway Tead[1] is comprised under the following heads, although he does not claim these to represent all the instincts, but rather the most important ones with reference to human behavior in modern industry.

1. The parental instinct
2. The sex instinct
3. The instinct of workmanship or constructiveness
4. The instinct of possession or acquisition
5. The instinct of self-assertion or domination
6. The instinct of submissiveness
7. The instinct of the herd (gregariousness)
8. The instinct of pugnacity
9. The play impulse
10. The instinct of curiosity

The scope of this discussion does not permit extended consideration of these various instincts. We shall have to pass over the subject with the following observations:

1. This list of instincts represents the *unlearned tendencies* of man, the responses which all men will make to given situations without regard to their schooling. The illiterate man, either European foreigner or Tennessee mountaineer, will react to certain situations just as surely as will a college professor or a Wall Street broker. Education does not modify the structure of man's nervous system; it affects one's response only by modifying his judgment in the situation, not by changing fundamentally the motives back of his conduct.

2. These instincts are not all present at birth, but develop or decline as their use is necessary during the career of the individual. For example, every normal child acquires the ability to walk at the age of from ten to fifteen months without

[1] Instincts in Industry.

having to be taught to do it. It is not psychologically correct to say that he *learns* to walk. He acquires this power because certain neurones develop during infancy which result in the bodily response which we call walking, and we could prevent him from walking only by resorting to most unnatural means of restraint. By encouraging and assisting the child while he is acquiring this power, we merely facilitate the responses which he is naturally trying to make because the new set of neurones and muscles are now beginning to function. We do not *teach* him to walk ; it is an instinctive action that develops at the proper time in his career. The same is true of behavior resulting from the functioning of the sex instinct at puberty and the parental instinct at maturity.

3. Human behavior should be interpreted in terms of instinctive responses to situations. To the situation "a man entering the shop a few minutes before the signal for beginning work sees a group of his fellow workmen in one corner of the shop," the response is "he promptly joins the group," and the underlying instinct is *gregariousness*. To the situation "quitting time," the response is "each laborer goes to his own home to eat and sleep," and the instinct is *habitation*. For any action, first consider what the situation was to which the action was a response, then determine the instinct which prompted the response. A study of this matter will greatly modify our interpretation of the motives which prompt the behavior of our fellows.

4. The skillful shop-teacher will carefully construct or control the situations within his shop in order to secure the desired responses from his students instinctively. Herein lies the foundation of good shop management. This topic will be developed further in subsequent chapters.

MENTAL CAPACITY

Mental capacity is distinguished from reflexes and instincts in consisting of general mental abilities rather than of specific motor responses and in referring primarily to native mental equipment. The instincts are largely animal qualities, not capable of improvement through education or training. The mental abilities are higher than these animal qualities and represent more peculiarly human powers. Psychologists have not as yet agreed on any complete catalogue of these abilities, but some of those commonly recognized are perception (through the special senses), observation, attention, memory, association of ideas, analysis, and judgment.

The human mind is merely the sum of all the sensations, feelings and judgments, resulting from the delicate adjustment of an almost infinite number of nerve fibres which in themselves are a part of the physical body. One may have at birth a plentiful supply or a poor supply of potential nerve endings which are ready to be organized and coördinated by experience and training, but unless one has the opportunity to learn from study and experience, the desirable connections may never be developed.

The maximum capacity of the mind in any particular field is, therefore, practically determined by physical inheritance of an abundant supply of nerve endings. Thus, it may be that one individual is born with two or three times as many nerve terminals connecting at the point at the back of the eyeball where the optic nerve — which is simply a bundle or rope of nerve fibres — is attached to the mechanical apparatus upon which the reflection of objects passing before the field of vision is registered. Such an individual's powers of observation are normally greater than those of the person of less fortunate heredity in this respect, whose lesser number of terminals of the optic nerve fibres limit his powers of optical perception and observation. Thus, one person may see at a glance a hundred details, all of which register sharply upon his consciousness, while another sees

only the gross outlines and shadows, and in between is the average person who sees some details but not all.[1]

Mental ability in any individual is always less than his mental capacity; it is determined by the number and variety of nerve connections that have actually been made by his environment and training. Inheritance sets the maximum limit (capacity), but as a matter of practice this maximum is seldom reached by any individual.

There is probably more variation in the strength or degree of the mental abilities than of the instincts, which are more uniform and constant, and it is this variation which determines the degree of general intelligence of the individual. The present attitude of psychologists is to regard a few specific mental powers as reliable keys or symptoms of general intelligence. It is the common observation of teachers that pupils standing high in one subject will usually get good marks in all subjects, while those poor in any subject are usually inferior in all. This fact is the basis of the tests now being tried out for measuring general intelligence. The effort is being made to determine what are the key abilities of normal persons; then, by checking up any particular individual, it can be determined by comparison whether he is of average, superior, or inferior ability; also it can be determined what group of abilities is strongest and most promising for development and usefulness.

Note that these intelligence tests are planned to measure *native* ability. A man's rating in them does not primarily depend upon his schooling. In the intelligence tests given in the United States army during the war, thousands of men were tested who could not read nor write nor even speak

[1] Trabue and Stockbridge, Measure your Mind, pp. 23, 24.

English, yet it was possible to determine their mental abilities as a basis of assignment to the various tasks of military service.

There are several types of tests based upon native ability. Besides the general intelligence tests mentioned above, there are the trade tests now being used in industry to determine the presence or absence of the required abilities for specific jobs, such as tests of eyesight and hearing; discrimination through sorting cards etc.; number checking; following simple directions; canceling out given letters; tapping with a pencil; steadiness; etc. The person who can perform these tests successfully or within certain limits of achievement presumably possesses the specific mental abilities required for the job.

Then there are the psychological tests now being tried by colleges for selecting students on the basis not of acquired knowledge, but of ability to acquire further knowledge. This ability is not determined by schooling, but by native endowment of mental power.

Finally, there is the old and universal test to which every man is continually subjected — the opinion of his fellow men. Every man takes the measure of every other man whom he meets, and his evaluation is determined in most cases by the native endowment of physical and mental qualities summed up in the words "character" or "personality." A man's neighbors really measure him not by the university degrees which he holds, nor even by the amount of money or goods he possesses, but by the powers and faculties which are his inherent possessions and which determine his conduct and his worth to his community.

HEREDITARY TRAITS

The principle of heredity is one of the most conspicuous facts of life. It is of interest to us here in aiding us to analyze other men, because due recognition must be made of their hereditary traits. We can thus account charitably for their shortcomings or expect large measure of achievement, for a man inherits mental as well as physical qualities. If a man's father or grandfather was a skilled mechanic, he is likely to show a tendency toward mechanical skill; likewise the musician's son is likely to evince musical ability; the artist's son is more likely to become an artist; the son of a scholar is likely to attain scholarly proficiency; and the statesman's son may be expected to display more than a common interest in public affairs. A man is popular because his father or mother was popular; that is, he inherits their good judgment and other qualities that win the respect of other men. On the other hand, the child of weak, sickly, slovenly, or lazy parents and grandparents is not to be blamed for manifesting the same qualities, although, of course, the tendency to many of these undesirable characteristics may to some extent be overcome by placing the individual in a more favorable environment.

Note that the inheritance of mental traits from immediate ancestors is *likely*, not invariable.

In all thought of inheritance, physical or mental, one should always remember that children spring, not from their parents' bodies and minds, but from *the germs of those parents*. The qualities of the germs of a man are what we should know in order to prophesy directly the traits of his children. One quality these germs surely possess — they are not invariable. Discarding syntax and elegance for emphasis, we may say that the germs of a six-foot man include some six-feet germs, some six-feet-one germs, some six-feet-two, some five-feet-eleven, some five-feet-ten, etc. Each human being

gives to the future, not himself, but a variable group of germs. This hypothesis of the variability of the germs explains the fact that short parents may have tall sons; gifted parents, stupid sons; the same parents, unlike sons.[1]

The factor of race cannot be disregarded in considering man's native equipment. While no data are available from which a scientific conclusion can be drawn, it is, however, a common observation that Italians are given to art, music, or fine mechanical skill; Hebrews are inclined to mercantile or intellectual pursuits; Irishmen have a propensity for politics; negroes are more amenable to personal service; and so on. The differences between races is not as great as the range of differences within either race, but the appearance of race characteristics in an individual is more likely than the appearance of particular traits of immediate parents.

All men are created with equal rights to life, liberty, and the pursuit of happiness, but they are not created with equal ability in any line. No man is responsible for the qualities or inequalities with which he is born into the world, and due allowance must be made for this fact in judging him. On the other hand, nature has endowed him with a certain combination of capacities or traits which determines to a large extent the kind of career in which he will be likely to render the greatest service to society and achieve the highest degree of satisfaction for himself.

QUESTIONS AND PROBLEMS

1. What are some of the common acts which may be expected of all or nearly all fourteen-year-old boys?

2. Why will a class coming into a shop for the first time proceed at once to inspect the machinery?

[1] Thorndike, Educational Psychology, Shorter Course, pp. 356–357.

3. Write out a list of ten common situations, responses, and underlying instincts connected with the conduct of a shop class; for example:

SITUATION: An idle boy near a machine with numerous levers and moving parts.

RESPONSE: The boy works these parts until restrained or interested otherwise.

INSTINCTS: Curiosity and manipulation.

4. Write out a list of all the nicknames applied to the boys in your class or to the men in your shop. What do these names indicate with reference to each person?

5. Select two or three popular boys or men in some group to which you belong. What qualities make them so respected and loved by their fellows?

6. Why are other men so unpopular?

7. What qualities do employers want in boys whom they hire? To what extent has the school developed these qualities?

8. Give the psychological meaning of such expressions as "pep," "red blood," "horse sense."

9. Note some of the current slang expressions of contempt, and consider the psychological explanation of them.

10. Which should you expect to become a better patternmaker, a Swede or a Hebrew? Why?

11. What are some of the reasons for a foreman's hiring the son of one of his own workmen?

12. What *native* qualities do you regard important for success in your trade?

13. What races are represented in your shop or department?

14. Is there any race antagonism on the part of workers in your trade? If so, is this due to any deficiency of native qualities necessary to the successful worker, or to other reasons?

15. To what extent is a man handicapped in your trade by the inability to read English? to write English?

16. To what extent does the ability to read or write a foreign language aid a worker in your trade?

17. Consider the value in your trade of the following qualities: good vision for small objects; good vision for objects at a distance; good color discrimination; quickness of perception; strong muscles; steadiness of muscles; rapidity in arithmetical calculations; ability to follow oral directions; ability to follow written directions; good spelling; good handwriting; physical endurance; accuracy of judgment; discrimination of tone; good memory; inventiveness; resourcefulness; thrift.

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III. Sense Perception Applied to Shop Work

It must not be supposed that native qualities alone fix and determine one's career. They are in the beginning only latent or potential, and are called into action by the experiences of life. They are, furthermore, safely established in the inner life of the individual and can be reached or stimulated into

action only through certain definite channels incorporated in the nervous system and known as the special senses ; that is, the senses of feeling (including muscular sense), sight, hearing, tasting, and smelling. All that any individual knows of the world he has learned through events that have happened within the range of his sensibility and have been reported by some of these senses to the central office in the nervous system, where, by means of the mental capacities, these events have been interpreted into meaning and have either resulted in immediate response in muscular or mental action or have been stored away in the memory for future use. Thus we see that the meaning of life and all the *deliberate* (as distinguished from instinctive) arts, skills, and habits of life are *acquired* by each person individually.

The fact that there are only these five or six avenues of approach to the human mind is one of the marvelously simple things of life ; it is also a most important fact for the teacher to recognize, since all his instruction must be arranged in the form of stimuli to act upon some of these senses. For the teacher of trade work an understanding of the action of the special senses is even more important, since manual skill is so largely a matter of the special training of these senses. A detailed account of the physiological action of the senses is impossible here, but as an introduction to this most interesting study, we will attempt briefly to analyze each sense and to note the various objective qualities which it enables one to perceive.

The Sense of Touch. The seat of the tactile sense is in the nerve endings located in or immediately beneath the skin and distributed over the surface of the body and interior of the mouth with varying degrees of delicacy, being most sensitive on the forehead, the temples, the back of the forearm, and

the finger tips, and least sensitive in the middle of the back. By means of it one perceives certain qualities of the objects which come in physical contact with these nerve endings, such as *heat*, *cold*, *pressure*, *softness*, *hardness*, *roughness*, *smoothness*, *form* (flat, concave, convex).

Muscular Sensation. Closely associated with the sense of touch (and often classified with it) is the muscular sense, by means of which we perceive the qualities of *weight* and *pressure*, and of *space relations* between things generally. By coöperation of the muscular and tactile senses we are enabled to perceive such qualities as *stickiness*, *roughness*, *solidity*.

The Sense of Sight. The seat of this sense is in the ending of the optic nerve spread over the interior surface of the eye and called the retina. Rays of light impinging upon the retina form the stimuli which, when interpreted in the brain, give percepts of the qualities of *light* or *darkness*, *form* (outline), *color*, *distance*, *motion*.

The Sense of Hearing. The auditory nerve, with its terminal in the delicate mechanism of the inner ear, is acted upon by the vibrations of waves in the air, and reports these vibrations to the brain as sounds. The quality of the sound is determined by the character of the aërial vibration. When the waves are irregular or nonperiodic, the result is a percept of *noise*; when periodic, it is a *tone* or *note*. The *force* of the waves determines the *loudness* of the sound. The frequency of the periodic waves gives the quality of *pitch*. The *form* of the wave determines the peculiar *voice*, or *timbre*, quality. The source of the series of vibrations is detected by the percept of *location*.

The operation of the auditory mechanism is by no means limited to any single series of vibrations or sounds at a time, but responds to and interprets all the numerous and complex

series of aërial waves that are all the time beating upon the eardrums, leaving it to the power of attention to select any particular series and bring it up to the plane of consciousness, while the others remain in the subconscious realm. In the series of sound waves in the conscious realm, one can recognize the combination of sound qualities as a single percept, or, with effort and training, can recognize the various qualities as separate entities. In other words, he may give attention to the tune or symphony as a whole, or he may recognize the separate pitches, with their degree of loudness and of timbre. He may be aware at the instant of only a single voice speaking, or he may, by exerting attention, recognize the sound of birds singing in the trees, the railroad train in the distance, his neighbor's phonograph, and a dozen other sounds at the same time.

A monotonous or accustomed sound soon sinks into subconsciousness; but a new sound, especially if it is borne by waves of considerable intensity (loud), forces itself into consciousness and causes attention to be given to the cause of the unusual sound waves. The new situation thus presented is promptly interpreted, and an instinctive response follows. The automobile driver readily detects a new noise indicating something wrong with the mechanism of his car: the woodworker realizes promptly when his circular saw strikes a nail in the wood; the engineer recognizes by the new squeak or groan that some bearing needs lubricating or adjusting; the clerk in a large office responds promptly to the fire-drill signal; and all laborers are pretty keen for the quitting-time whistle. The sense of sound is used more frequently than either of the others to give warnings of danger, because it can be acted upon from all directions; whereas, with the sense of touch a contact with the skin must be made, and with the sense of

sight the range of operation of visual stimuli is limited to an area directly before the eye.

The Sense of Smell. The seat of this sense is in the surface of the nostrils, where the olfactory nerve endings are especially adapted to receive stimuli which give percepts commonly known as *smells* or *odors*. The operation of this sense is closely akin to that of touch, inasmuch as *contact* is necessary upon the olfactory nerve terminals by minute particles of the substance which are borne upon the air. When the air is still, the smell acts equally in all directions from its source, diminishing with distance; when the air is in motion, the smell is more potent in the direction of the air current.

Pleasing smells are described as *fragrant* or *sweet*; unpleasant smells as *strong*, *sour*, *pungent*, etc. More commonly odors are described by the characteristic of the object giving them off; in other words, by experience we associate certain odors with particular substances, so that instead of describing the quality of the odor, we perceive at once the substance with which the odor is associated, and speak of an oil smell, a pine smell, a fish smell, etc.

The sense of smell is important as a revealer of the outer world. Through it we enjoy pleasure or discomfort in the vicinity of other objects or substances. Like the sense of hearing, it performs large service as a warning of danger. Nature has provided a characteristic smell for many dangerous situations. By it we recognize bad air upon entering a room. Through smoke we are warned of incipient fire; decaying organic matter gives off its characteristic unpleasant odor; the cabinetmaker recognizes the smell of burning glue; the engineer, likewise, becomes aware of an overheated bearing; and the cook depends upon smell for recognition of the stages of the processes of food preparation.

The Sense of Taste. The gustatory nerve terminals, in the back part of the tongue and palate, are adapted for receiving the stimuli of taste. Through this sense we recognize the qualities of *sweet, sour, bitter, acid, alkaline, saline, fiery*, etc. This sense, being specifically connected with the nutrition function of the body, is therefore of special importance in occupations connected with food preparation. In most mechanical or clerical occupations it is not of special vocational value.

Coöperation of Senses. The most fundamental of all the senses is the sense of touch. The other senses are all modifications of it. Sapid substances must *touch* the tongue to be tasted, odoriferous particles must *touch* the nasal membranes to be smelled, air waves must *touch* the eardrum to give sound, and ether waves must *touch* the retina of the eye before sight is possible. Touch is the first differentiated sensation to be developed in the embryo before birth, and it is the one sense that never becomes obliterated during the life of the individual. Persons may be blind or deaf ; the senses of smell or of taste may be dulled or rendered totally inactive by disease ; but we cannot conceive of a person in consciousness being totally devoid of any tactile sense.

Upon the sense of touch or its ally, the muscular sense, the other senses depend for assistance or confirmation. We may think we see ghosts or hear them, but we are skeptical of their reality because we are unable to touch them. The child gets his first idea of solidity and distance through the coöperation of the senses of touch and sight. The latter sense alone would show all things in the same plane with qualities only of shade, color, and outline.

In recognizing most objects we perceive qualities which are revealed, not through a single sense, but by two or

more senses working together. It is practically impossible to describe any common object by the qualities perceived by any single sense.

Discrimination. Furthermore, it is important to note that any quality is perceived only relatively; that is, by comparison with some other degree of the same quality or by contrast with an opposite quality. We feel a surface to be *smooth* by contrasting it with the memory image of some other surface which we know as smooth or rough. Soapstone is *soft* in comparison with quartz, but hard as compared with putty. In other words, we recognize an object by noting its characteristics which are different from the corresponding characteristics or qualities of a similar or different object. Two apples may appear to be the same size, shape, and general color, but some distinguishing feature must be found. Upon careful examination a difference in marking (color) or size (form) will be noted. It is possible to have two objects so similar that no distinguishing marks can be recognized, but there is the difference in location (space relation), and we can speak of the right-hand and left-hand objects, or of the upper and lower, front and rear, etc. With tones there is a difference in time perception.

The ability to single out the difference or degrees of difference between two similar things or qualities is called *discrimination* and is a most important psychological principle in trade work. Upon it depends all sense-training. Practice enables one to become very keen in discrimination, and any accomplished art or skill is the result of such practice. To write a word with a pencil means a number of separate discriminations in muscular sense in pushing or pulling the pencil, in order that its point may make the correct contact and traverse the correct space on the paper; this is usually aided

by the visual sense, although the latter is not necessary, because blind persons also can write. In playing the piano the visual sense discriminates the shape, location, etc. of the marks on the sheet which comprise the written music; this visual stimulus, conveyed to the brain, is interpreted and redirected through motor nerves to the proper muscles which, because of the mental discrimination, make the necessary movements to operate the proper keys and to produce not only the desired tone but the proper loudness and length of duration of the tone, which in turn is verified or checked up by the discriminating power of the auditory sense. Any workman learns to exercise the proper visual, tactual, muscular, auditory, or other discrimination in selecting materials and using the correct tools to perform a given job. That is, he knows how to differentiate properly in the color, shape, or other qualities of his material and in the direction, force, etc. of his muscular movements. He is a rough or fine workman in proportion as he is able to make such discriminations satisfactorily.

Teaching a trade to an apprentice or pupil, therefore, means to call to his attention, by comparison or contrast, the desired qualities of material which he should use, and to give him opportunity through exercise to develop the necessary muscular discrimination to perform the work. In other words, teaching is helping the pupil to develop discrimination ; and the efficiency of the teaching may usually be measured by the minuteness of the discrimination attained by the pupil.

Defects in Sense Perception. Since the point of contact of the mind with external stimuli is through the sense organs, it is important that the reception of the stimuli be as complete and accurate as possible. The eye and the ear, which are the

most important avenues of information, are also the two organs most frequently defective. What is more serious is the fact that these defects are so subtle that they have not hitherto been readily detected, nor has their importance been realized. Children often have defects of sight or hearing of which neither they nor their parents are aware, which become hindrances to learning and produce headache, nervousness, dislike for school work, truancy, and social disorder. Many of these defects will also reduce the efficiency, and in some cases completely disqualify a person for certain occupations. For example, a color-blind man could not be a locomotive engineer, a steamboat pilot, or a salesman at a silk-counter; nor could a woman with defective hearing or speech satisfactorily fill the position of telephone-switchboard operator.

The most common forms of visual defects are *myopia*, or nearsightedness; *hypermetropia*, or farsightedness; *astigmatism*, or irregular curvature in the cornea, or lens, causing imperfect focusing; *strabismus*, or "cross eyes"; and *color blindness*. These defects may result either from heredity (color blindness and strabismus usually do) or from overstrain of the eyes through excessive reading of fine print, doing fine work in drawing or mechanical work, or improper illumination.

Defects of hearing consist of degrees of deafness, either partial or total, in one ear or both, and inability to discriminate musical tones. These defects are usually either hereditary or the result of illness. Schoolroom conditions are not as conducive to auditory as to visual defects. Some occupations involving intense noise, such as boiler-making and structural ironwork, are conducive to deafness, but school shops have not yet included these types of work to any objectionable degree.

The shop-teacher must be alert to detect failure of students to discriminate percepts of either sight or hearing. Having discovered such a case, he should report it at once in order that the pupil may receive careful examination by a physician.

As far as possible the teacher should control the conditions in his shop so as to avoid irritation or strain upon the eyes. Shop equipment should be arranged with due regard to lighting. Textbooks, instruction sheets, drawings, etc. should be printed with quality of paper and style of letters that will not strain the eyes. Fine lettering or drawing in the blue-print form, with white lines on blue background, is particularly objectionable. Pupils should not be kept at fine or close work for too long periods without opportunity to rest the eyes.

Aiding the Senses. One more point that should be noted in connection with sense perception is that man alone of all the animals has learned to use artificial means of aiding his senses. The hammer, crank, chisel, or lever in any form aids the muscles. By means of the lens he supplements his sense of sight to a marvelous extent. He can not only amplify sound, but he can reproduce it thousands of miles away and make it serve him in thousands of ways. He uses the pyrometer to achieve far more reliable results in the use of heat than he could possibly secure by trusting to the sense of touch to discriminate temperature, or to the sense of sight in recognizing the results of variations in temperature in working metal, etc. He reënforces his power of discrimination by using scales of various kinds for measuring weight, distance, color, sound, and other qualities, and secures more accurate results than he could possibly do with the senses unaided. Every instrument or machine is a device of man for aiding or supplementing his native senses.

QUESTIONS AND PROBLEMS

1. Show in tabular form the qualities perceived by each of the senses.

2. Write a description of any three of the following: a piece of cast iron, a piece of tool steel, a piece of glass, a piece of pine, a piece of copper wire, a piece of lead pipe, a rusty nail, a pot of paint, lubricating oil, a silver dollar, the gong of an electric bell, a piece of silk cloth, a piece of woolen cloth, a piece of cheesecloth, a piece of sole leather, a sheet of writing-paper, buttermilk, Swiss cheese, lemonade, a baseball, the E string of a violin.

3. Examine your description, noting the qualities that you have used in relation to each article, and determine by which sense each quality is perceived.

4. From the standpoint of sense perception describe the operation of sawing a board true to a line with a hand saw; of turning a shoulder on a piece of steel in an engine lathe; of justifying a line of type; of any other operation in your trade.

5. In what particular ways are each of the senses important in your trade?

6. What devices are used in your trade for aiding the senses?

7. Explain the working of the motion picture from the standpoint of visual perception.

8. Of what value is a consideration of the senses in planning lessons?

9. Why should a trade-teacher analyze his trade before attempting to teach it?

10. What are some occupations for which a person would be disqualified by color blindness? partial blindness? partial deafness? inability to discriminate musical notes? obstructed smell?

11. What are some occupations for which a person would not be disqualified by total blindness? total deafness? loss of hands?

12. In what ways is a keen sense of smell important for a school-teacher?

13. Applicants for evening machine-shop classes sometimes spell *lathe* "laid." How may we account for this?

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IV. Trade Habits and Trade Judgment

We have said that upon every man rests the moral obligation to render to society his maximum of productive effort. Notwithstanding this obligation very few men work up to the level of their possibility; the majority continue much below their limit of efficiency in most of the habits required by their trade. Upon the instructor, therefore, is placed the responsibility of directing the formation of trade habits on the part of his students that shall enable them to give maximum production.

FORMING TRADE HABITS

Putting the matter of maximum efficiency in learning and performance upon the basis of forming correct trade habits, let us consider briefly some of the principles of habit formation. These are based upon the laws of learning which we discussed in Unit Four.

A habit is an aptitude or propensity for doing anything in a particular way. This means that in the nervous system

a certain definite pathway or tract has been formed through which a particular stimulus or impulse always finds its outlet. The discharge of this impulse through this tract tends to become subconscious, therefore automatic or mechanical, although it may begin either consciously or unconsciously. The beginning of a habit requires a stimulus which is expressed by an exercise of the will either conscious or unconscious. Each repetition of the act requires a diminishing exercise of the will until the movement becomes pure habit, when the effort of the will is practically zero.

The efficient workman is the one whose motions are performed repeatedly with surety and precision and with a minimum of attention. As a result of repetition his acts have become automatic, obeying the law of exercise. *Repetition*, or drill, then, is the first principle of habit-forming and is one of the most valuable teaching-factors. Furthermore, habit is strengthened by *regularity* of repetition. Every exception in the regularity weakens the habit. Continuity in training is essential.

It is a part of the teacher's skill to know just how much repetition to require. Practice periods should not be so long as to induce fatigue and discomfort in violation of the law of effect. They should be frequent and regular. The length of the period, the frequency, and the total duration of the practice must be determined for each skill separately. No general quantitative rule can be given. The learning-practice of any given act should cease when maximum proficiency is achieved; that is, when the increase in skill stops or is no longer profitable in proportion to the time and energy expended (see Fig. 2, p. 50).

A second principle of habit-forming is *invariability*; that is, the act should always be done in the same way. The

habitual performance depends upon association with the cue. In other words, there is a habitual sequence of acts. It is essential that there be the right group of associations at the outset. This is an important item in planning lessons.

The old saying "Practice makes perfect" means perfect reproduction of any act or performance whether right or wrong. It is essential for the instructor to see that the act is correctly performed every time and especially the first time; for, whatever way it is done, it leaves its corresponding trail in the nervous system which succeeding impulses may follow, whether this be the path of the right or the wrong way to do a thing. A workman may become just as proficient in the wrong method as in the correct method. A bad habit is difficult to break, because its groove is so deeply worn. The instructor should therefore be on guard against the wrong performance of any act of skill which he is trying to teach. Never allow an exception to the correct procedure.

In establishing a new habit, *intensity of the first impulse* is also a valuable factor. The more force behind the stimulus the more definite is the path made by it, and the easier it is to send a second impulse over the same trail to the desired response. A teacher, then, should seek to give as much emphasis as possible to the new lesson he is trying to teach. Let the new act be prompted by as strong a stimulus as possible. Devices of illustration, experiment, novelty, contrast, etc. all help to give intensity to the new impulse.

The principle of *satisfaction* must also be considered. The law of exercise alone will not suffice in habit formation, at least for the kind of habits that the trade-teacher wishes to establish. Mere repetition, even with all the emphasis or intensity that can be brought to bear, will not produce habits of action the results of which are not satisfactory to one

who performs the act. The law of effect must be recognized as well. A man will repeat and make habitual only those acts that result in some kind of satisfaction for him.

Pleasure in the broad sense must be the accompaniment or result of any connection that is to become habitual. The satisfaction may be of many different sorts, physical, emotional, or intellectual. It may be occasioned by a reward or recognition from without or by appreciation arising from self-criticism. In some form or other it must be present.[1]

The satisfaction usually arises from the instinctive desire for approbation. When this approbation is received either from oneself or from others, the instinct is satisfied, and this stimulus to action no longer operates. This is sometimes expressed as the law of minimum effort, and means that the standard of the habitual performance is no greater than necessity requires. Man does not exert himself needlessly. The result which satisfies the demands of the occasion is good enough. This accounts for plateaus of accomplishments, as discussed in Unit Four in connection with laws of learning. It is more difficult to rise from one plateau to a higher plateau than to attain the higher standard in the beginning by an unbroken continuity of effort.

"Learning a trade" means reaching a level of action or accomplishment in the processes or operations of the trade, above which one does not rise without putting forth strenuous effort which his daily routine does not call forth. The exceptional effort is rarely expended unless new demands, responsibilities, or appeals are presented to him. For this reason a student will rarely attain a standard of excellence higher than the instructor demands.

[1] Strayer and Norsworthy, How to Teach. Used by permission of The Macmillan Company, publishers.

The power of habit has certain advantages:

1. It makes right conduct easy to acquire. Hard things become easy by repetition.

2. It is economical of power and effort by regulating our living and conduct. James calls it the "flywheel of society."

3. It aids the intellectual processes of attention, observation, memory, reasoning, and judgment.

4. It is valuable to education, either trade education or general education. Education is an effort to form correct habits of thinking and doing. Progress in the formation of habit is a test of progress in education.

On the other hand, we should not be oblivious of some of the disadvantages of habitual conduct. Domination of habit means arrest of development and deadening of will and feeling. Habit also tends to conservation and conventionalization, making adaptation to new conditions more and more difficult.

DEVELOPING TRADE JUDGMENT

The principles of habit formation apply particularly in teaching highly specialized or repetitive operations (such as feeding a press) which require a minimum of thought-content and a maximum of reflex action. They are the responses that may become largely automatic, and they represent the production activities for which operatives may be trained, or which may even be performed by mechanical means. It must be recognized, however, that the human mind is more than a machine, and the good mechanic is more than an operative. As important as specialized trade habits may be, there is another important aspect of the mechanic's work to be considered; namely, trade judgment.

In the higher thought-levels the human mind operates in certain definite ways: (1) It *analyzes* a situation into its

elements or factors. (2) It *recognizes* certain of these elements that have formerly been in one's consciousness (an act of memory). (3) It *ascribes* or infers meaning in these elements or combinations of them. In other words, it *interprets everything in terms of purpose.* (4) It *abstracts* from concrete experience *general principles of procedure.* Past experiences are raised to the level of reflective consciousness, and their bearings upon the immediate situation are more or less clearly considered. (5) Finally, *it selects the elements and methods of procedure* with reference to a new end to be attained.

For the workman, then, trade judgment means that he can select from any situation the elements and procedure best suited to his purpose. To illustrate, let us take the following situation: the job of making a machine bolt. Some of the factors of the situation are the use to be made of the finished bolt, the stock from which it is to be made, the drawing with dimensions, the working-conditions of the shop, and the operations in shaping the bolt. Each of these can be further analyzed into several other elements. The mechanic must recognize all these elements, then select and arrange them into a course of action to accomplish his purpose. His success will depend upon the degree to which the elements and procedure chosen by him shall render the most satisfactory results.

For the teacher the significance of this matter of trade judgment lies in the fact that each of the five factors of judgment mentioned above are susceptible of improvement by training. The organization of the instruction program should provide ample practice for the student in analyzing a job into its elements, in finding the fundamental meaning or purpose of the job, in determining general principles of procedure applicable in the case, and, finally, in selecting the best combination

of elements and method of procedure for performing the job. The student's first efforts will be crude and imperfect. The instructor must carefully watch him at each step of the judgment process, giving such guidance and assistance as may be necessary.

QUESTIONS AND PROBLEMS

1. Which should a student develop first, speed or accuracy? Why?

2. List some specific habits of workmanship that you should seek to develop in your students.

3. What methods can you propose for determining the progress of your students in forming these habits?

4. Define "learning a trade" in terms of habit formation.

5. Criticize an unsatisfactory job in your trade from the standpoint of trade judgment.

6. With which should the shop-teacher be more concerned: right and wrong habits or good and bad habits?

7. Can you discover any methods of work in your trade that you adopted unconsciously?

8. What is the relation between habit and skill?

9. What are some of the common bad habits of workers in your trade that you should train your students to avoid?

10. An instructor in drawing accepts from students plates with conspicuous mistakes, saying that as the student progresses he will naturally outgrow these errors. Is this good pedagogy?

11. What are some specific habits that your students should acquire with reference to the care of tools? with reference to beginning and closing the day's work?

12. How many times should a student make a V-thread as an exercise in thread-cutting?

13. Why is it important to set a high standard of workmanship for an apprentice at the outset?

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V. HUMAN MOTIVES AND INTEREST

In organizing teaching-material and in conducting class work for the purpose of securing from students certain desired responses in performance and trade practice, the instructor must comprehend something of the fundamental instincts and motives which govern human behavior. We have seen that the responses which every man gives to the various situations of life are determined by certain deep-seated tendencies, among which are *physical activity*, the tendency to enjoy *mental activity* (commonly known as "curiosity"), and the instincts of *manipulation*, *constructiveness*, *acquisitiveness*, *rivalry*, *pugnacity*, *gregariousness*, *kindliness* toward weaker individuals or in the presence of suffering, *desire for approbation*, *giving or withholding of approbation* (domination), and *secretiveness*. These instinctive tendencies are the foundations upon which rest the motives for nearly all human conduct, such as honor, truth, position, beauty, progress, compensation, and welfare. We have seen also that each individual is provided with the outfit of sense organs, through which are poured the percepts from the outer world which are interpreted into meaning by his native mental capacities of association of ideas, reason, judgment,

etc. In the complex of his personality exist both hereditary tendencies from his ancestors and habitual responses to the situations that have been presented to him throughout his own lifetime. His attitude toward the world has been shaped by his environment, by the kind of home he has lived in, and by the kind of people with whom he has associated.

In considering further the matter of getting and retaining the student's interest, let us recall the principles of mental action discussed in Unit Four in connection with the laws of learning; namely, readiness, exercise, and effect. Interest is controlled primarily by the law of effect; that is, we are interested in the thing which gives us some kind of satisfaction. When the attendant emotion is irritation or annoyance we are not interested. The intensity of the annoyance may force our attention upon the thing or situation for the time being, but our interest is in finding some means to evade or escape from the irritation. The propensities, tendencies, or instincts are, as it were, the inspectors for testing the situations of the external world, including one's physical organism, and for reporting the resultant emotions to the inner self; they are the mainsprings of action, the urges and stimuli governing human aspiration and desire and determining the limits of achievement for any individual; they are the primary forces at work to make conduct what it is, the ultimate source of all human motives. These sources of human behavior, so vitally and organically related to the human nervous system, are the interest factors with which the successful instructor must coöperate.

One of the most important interest factors is the *propensity for activity*. Nature did not design man for sedentary or stationary work; he indulges in such occupation of his own accord, and for it he pays the inevitable penalty in loss

of physical health. This kind of work characterizes the adult who has acquired the liking or necessity for it, rather than the youth who is still more as nature created him. Boys in shop classes do not want to keep still ; they want to be active. The instructor should therefore make his demonstrations and lectures as brief as possible, reducing the repression of their activity to a minimum and taking maximum advantage of their natural desire for motion and physical activity.

Correlative with the propensity for activity is the principle of *fatigue*. The old notion that we get tired by reason of temporary exhaustion of muscular or nervous energy is now discounted. Thorndike tries to explain fatigue as a result of temporary satisfaction of some activity or set of activities whose urge is thus diminished and yields to other urges which have been ignored during the predominance of the earlier activities, but whose demand for recognition, exercise, and satisfaction is now heeded. It is true that for some forms of strenuous muscular exertion, physical poisons are generated faster than they are neutralized or eliminated, resulting in muscular fatigue indicated by diminishing energy and sometimes even pain or soreness. No propensity or tendency can hold the center of the stage indefinitely. Each must have its share of exercise and satisfaction, although, according to the law of exercise, continued disuse or repression of an impulse or tendency will weaken it accordingly. The combined urge of all the propensities, however, prevents any one of them from holding undisputed sway for too long a time. According to this theory physical activity must in due time receive its satisfaction and give way to the play instinct in recreation, to the tendency to enjoy mental activity, or to some other propensity or combination of propensities. The physical need for food is one of the most imperious of all

urges, followed closely by the needs for clothing and shelter. The parental, or family, instinct and its intimate ally, the instinct for habitation, are also powerful urges and insist upon their share of recognition, as does also the gregarious instinct, or the desire to mingle frequently with larger groups of one's fellow men. The succession of dominance of these urges establishes the routine of the day — food upon arising in the morning, the day's work, home to the family, food again, the theater, the club or lodge meeting or reading and study, then the dominance of the physical demand for sleep.

This fact of fatigue or of alternating dominance of various urges must be recognized by the instructor in planning the routine of work for his students. The nature of each student rebels against either inactivity or monotony. To know how much of each feature of work and play to allow; to recognize and satisfy the various urges originating in the physical and mental make-up of his students, this is one of the consummate skills of the teaching art, to be master of which means to have a class of interested, satisfied, and happy students.

Closely akin to the propensity for exercise is the *instinct of manipulation*. Every man and, more particularly, every boy loves to handle things. The new apprentice if unrestrained will invariably go about the shop handling various objects, pulling levers, and turning the wheels of any machine available (the instinct of curiosity also acts in this situation). Now if the boy loves to handle things, then just as promptly as possible give him an exercise to perform which will involve manipulation. With a minimum of theory and explanation let him begin to do some real work. A simple job will satisfy the propensity and at the same time provide him with experience from which through later reflection to draw out

the underlying theory or the "why" of his action. Nature has ordained that we shall "learn to do by doing." Remember also that the busy student is the contented and happy student. Nothing will precipitate disorder in the shop more readily than for a student to be out of a job; that is, left with nothing to do. His instincts of manipulation and curiosity will surely find some exercise — quite likely in activity that will not meet with the instructor's approval. These instincts cannot be suppressed; they may and should be directed and controlled.

The *creative instinct*, called also the instinct of workmanship, contrivance, or constructiveness, is one of the foundation stones in human nature upon which to build trade skill. In its exercise it coöperates with the previously mentioned instincts of physical activity and manipulation; also with the tendencies of intellectual activity in planning, and of self-assertion, self-direction, and self-control in carrying out; and, finally, with the satisfaction of proprietorship or reward as the end to be attained. The word "achievement" also signifies the expression of these tendencies. The strength of the creative instinct varies with different conditions, such as race, environment, etc., but it is present in some degree in all normal human beings. For subnormal or feeble-minded individuals the capacity for physical activity does not seek the stimulating companionship of the creative tendency; consequently such persons will work at monotonous, routine jobs, such as machine-feeding, requiring a minimum of intellectual activity. The number of such persons is relatively small, as we have seen in considering the distribution of intelligence, and the work of the trade or vocational school is to be organized for normal, not subnormal, students. The boy likes to see the result of his activity in accumulated stacks of finished work or in assembled or perfected pieces

of craftsmanship. He also likes to feel that he had a share, at least, in the planning of the work, that its execution was accomplished through his own self-directed efforts, and that the completed work reflects some further substantial satisfaction for him through the approval bestowed by his instructor and friends.

The instructor should not plan the student's routine so minutely as to rob the latter of these instinctive satisfactions. The bane of our age of industrialism is that tasks have become so subdivided; too much monotonous repetition is required of workers, with too little exercise of the other elements entering into the creative propensity. The consequent dwarfing or thwarting of the workmanship instinct has been attended by the inevitable spirit of dissatisfaction and unrest among the workers, and the elimination of the old-time craftsmen. The restoration of this type of worker seems almost hopeless, but the satisfactions which he enjoyed are fundamental and must be provided in some way. In the trade school there is some opportunity to exercise students in the all-round practices or elements of trade skill, and the generation of students sharing this privilege will go out into the industry with a satisfaction already attained which will to some extent safeguard them against the restlessness evinced by workers whose instinct of workmanship has not been satisfied.

Another element in the craftsmanship propensity is *self-confidence*. The student must feel that he can do the job. The assignment should therefore be within his ability to perform by reason of his previous experience. The new learning difficulties of any job should not be too numerous nor too far advanced, and the assignment should be presented in a manner that he can understand. To give an apprentice a job too difficult for his stage of advancement or with indefinite

instructions is to foredoom him to failure, with its inevitable discouragement and loss of interest. On the other hand, the enthusiasm, the satisfaction, and the joy of achievement that come to him for successfully completing the job give still greater confidence for attempting a more difficult job the next time.

Closely allied to self-confidence is *pride in good workmanship*. We find greater enjoyment in doing the things that we do well. Hence the importance of having apprentices learn thoroughly whatever they undertake. Haste at the expense of thoroughness is sure disaster in the long run. A *good* job is more to be desired than a quick job. The enjoyment of good work is the secret, soul-gratifying compensation of the artist and the underlying spirit of true craftsmanship.

In this connection the instructor should be aware of the opposing characteristic of human nature which we have already mentioned — the tendency to minimum effort. We do not raise our work to a higher standard than is required of us. This means that students are not likely to do work of better grade than the instructor demands. If they do poor, slovenly work it is because he accepts it. On the other hand, it is surprising what degree of excellence can be attained by a class whose instructor exemplifies and insists upon a high standard of workmanship. Admiration of excellence is, indeed, an instinctive trait of mankind. The student therefore respects the instructor who holds him to a high standard, while he naturally discounts the boss who is lax in workmanship. Remember that the quality of workmanship of the student always reflects the standard of the teacher.

A most fundamental motive in the craftsmanship propensity is the *instinct of compensation*. Physical activity, manipulation, and constructiveness are not ends in themselves;

they are but means to some further ends. All activity is to be interpreted in terms of purpose. No man likes to feel that his activities are for naught; he instinctively evaluates his efforts and desires to participate in the fruits of them. He will not be interested in his work unless he is aware of the ultimate advantage of his exertions. The apprentice or trade-school student has the great life-career motive in desiring to learn the trade; therefore he wants to feel that every job or lesson that he performs is of direct benefit to him in attaining that end, and that it sets him measurably forward toward the goal of his ambition to become a journeyman mechanic. If the job contains no new learning factors; if it is a production assignment which he has already learned to perform, from which he realizes no new increment of skill or trade knowledge, and for which he receives no compensation, monetary or otherwise, he cannot be expected to display much interest in the task, and he will sooner or later resent the exploitation. This again obeys the law of effect. Therefore, each job assigned to the student should be one that will yield to him some definite trade value which he will readily recognize. This is why at the beginning of each lesson the specific objective should be stated, either implied in the lesson title or given in the introductory sentence.

The instinct of compensation is satisfied by the device used in some schools of issuing a credit certificate upon the completion of each unit. This is concrete evidence of the student's attainment and is equivalent to a pay check issued upon a piecework basis. Most students or apprentices will highly prize these certificates, and with great pride will exhibit them to parents and friends. The certificate should be most specific as to the actual work or character of the unit completed. It means more to all concerned for the student to

receive a credential for satisfactory completion of a unit in "Rigid Conduit Wiring" or "Armature Winding for D. C. Motors" than to be given credit for "Electricity — Fifth Semester." The latter is the academic-school method, but most unsatisfactory for the trade school. In the occasional cases where a student changes schools or an apprentice changes shops, such a system of credit certificates would

Vocational School, Elizabeth, N. J.

Credit Certificate

This is to Certify *that*_____*has completed the work outlined under topic*_____*in the*_____ *department of this school, and is therefore given credit for the course prescribed for graduation from this department.*

*Given this*_____*day of*_____*192*____

Instructor Director

prove a simple and satisfactory form of credential to indicate the work completed in the first institution, and should be accepted at face value in the new school or shop entered so that he would not have to repeat work already covered.

The question is sometimes raised by school directors (never by students) as to the feasibility or wisdom of paying students for their labor on production work done in the school. The rationale or motive of such discussion is to satisfy the compensation instinct. The efforts made to do this have been very few and feeble and have not been successful to any appreciable extent. If a student is asked to work out of school hours on job work for which the school receives cash

remuneration or for which anyone outside of the school would be paid in cash, then he should be paid for his labor. During school hours, however, the values to be derived by the student are instruction values, and the work should be so organized and conducted that he will readily recognize these values, and experience the resultant satisfaction. The school has no business exploiting student labor for the sake of earning money. Trade education in public schools should be conducted at public expense. No trade school, public or private, has ever received any appreciable amount of its cost of maintenance out of the income from student labor, nor should it.

Getting the attention of others is a propensity that is more or less active in all normal human beings. Whether in approval or scorn, we insist on being noticed by our fellows. No matter how shy or modest he may be, no man can stand being ignored. He wants his fellows to know certain things about him. This inclination, when combined with the faculty for loyalty to some worthy object or agency, is gratified by the device of wearing insignia of various kinds, such as buttons, sleeve bands, special caps, and even complete uniforms, as is done in the military schools and in some high schools. The youth wearing such insignia secures the attention of every person he meets and silently proclaims his status.

The *desire for approbation* is another primary instinct. Not only do we want others to notice us, but we want them to notice us approvingly ; moreover, we are especially anxious for the approval of certain persons whom, by reason of our instinct of submissiveness, we recognize as our superiors. When the apprentice receives the approval of his foreman for a job well done, with what enthusiasm he will attack the

next job! A word of commendation costs nothing to give, but yields marvelous results in increased interest and effort. Closely akin to the desire for approval is the satisfaction always experienced by the student or apprentice from kind expressions of sympathy and helpfulness. When he feels that his "boss," whether instructor or foreman, is interested in him and trying to help him, his interest is greatly quickened. The attitude of the instructor toward students should always be stimulating and encouraging. The desire for approbation and attention from others is the basis of the motives to which instructors appeal in the use of rewards, posting honor rolls, and other devices to stimulate the interest of students.

Rivalry and competition are instinctive and powerful human motives. We do not want to be outdone by the other fellow; we will exert ourselves to the utmost to keep up with him and to surpass him if possible. In order to do this it is necessary to know definitely his state of progress, just what point he has reached. This factor, of course, enters into group work with a class where the work and progress of each student are openly revealed to all. It is a less potent incentive where only a single apprentice is working without the stimulus of rivalry with others.

These motives are utilized in the student's progress chart, which provokes rivalry because each student can compare his attainment with that of others. If he is ambitious, he will endeavor to outdo the others. Even if he is lacking in ambition, he will be more likely to make an effort to keep up, rather than suffer the humiliation of being a laggard or bear the scorn and teasing of his classmates.

One further instinct deserving of special mention here is *domination* or *control*. Every person wants to be master of

somebody else to some extent; he also wants to control the forces of nature. This propensity is just as strong in students as in adults. It is closely allied with the feeling of proprietorship. The boy strenuously objects to any other student's preëmpting the bench or tools that have been assigned to him, nor will he tolerate interference with his work by another. He loves to be given responsibility in caring for the tool room or performing any other duty which involves the privilege of granting or refusing requests of his fellows. His delight in operating machinery is prompted by this propensity, coöperating with the instinct of manipulation. When his satisfaction in a situation involving this instinct is thwarted by interference of his fellows, the aid of the pugnacious instinct is promptly forthcoming.

The above comments are by no means an exhaustive discussion; they are but an introduction to a field of study only recently recognized by psychologists and personnel workers, which promises much of practical value for all persons having control over the behavior of others.

QUESTIONS AND PROBLEMS

1. What bearing does the subject of human instincts have upon the interest of apprentices in your trade?

2. Write out in tabular form the name of each fundamental instinct or tendency, the manner in which it is exercised, and the character of its satisfaction.

3. How does the law of readiness apply to the matter of the student's interest?

4. Explain the difference between securing attention and directing attention.

5. What is the difference between interest and attention?

6. List all the elements allied with the propensity for craftsmanship.

7. List as many as you can of the various devices which you have observed for stimulating interest.

8. List what you regard as the social instincts. Show how they apply in students' behavior in shop classes.

9. How does the apprentice obtain satisfaction through the instinct of domination?

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VI. RATING STUDENTS IN SHOP WORK

One inevitable phase of the teacher's work, growing out of the principle of variation in human ability, is the grading or rating of students. In this, a fourfold purpose is evident:

1. To check up periodically the progress of students.

2. To inform students and their parents of this progress.

3. To record an evaluation of students' ability or relative worth.

4. To disclose strong or weak characteristics.

Rating Schemes. The commonly used systems of marks in school work generally will not answer for use in rating apprentices. Blanket grades expressed in such terms as percentage, A — B — C — D — E, Excellent — Good — Fair — Poor — Failure, Satisfactory — Unsatisfactory, etc., are vague and indefinite and are not stated in terms that are readily intelligible. Likewise unsuitable are the ordinary methods of arriving at the rating: the snap-judgment method, with its guesswork and susceptibility to personal feeling; or the

comparative method, of giving the best student the highest mark, the poorest a suitably low mark, and rating the others relatively between these marks. These methods are based upon variable standards rather than upon the fundamental skills, qualities, or characteristics which actually function in the work for which the student is being rated. There is a feeling on the part of all school directors and progressive instructors, as well as thoughtful foremen having charge of apprentices, that much is still to be desired in the matter of rating-schemes.

Methods and terms of evaluation in ratings also have failed to hit the mark. In our school shops there has been too much job work produced with student assistance but instructor's thinking, and with much publicity in the way of photographs of completed jobs and statements of financial advantage to the school; but we do not see enough reporting of production work in terms of students' achievements in specific skills. A board of education made up of hard-headed business men, accustomed to balance sheets expressed in dollars and cents, may be impressed by a report showing that the carpentry department has built forty tables at a value of eight hundred dollars, presumably all net gain to the school system (although it never is); but how many instructors or superintendents of schools are given to reporting that in the making of this lot of tables, ten boys learned to use the jack plane, six boys mastered the laying out and cutting of mortise-and-tenon joints, five boys learned to glue up table tops, six boys learned to apply stain and varnish, etc.? How many pupils receive "report cards" showing a list of the skills accomplished during a given period? Instead of saying that the job done by a pupil is worth so many dollars and that his rating is 90 per cent, we ought to say that his effort has netted him such and such specific skills.

The Score Card. More satisfactory than either of the rating-schedules mentioned is the score-card method of listing the essential qualities of the work or characteristics of the student as rating-factors. Among the qualities suggested as entering into various branches of trade work are

1. Accuracy
2. Ambition
3. Aptitude
4. Artistic ability
5. Attendance
6. Attitude
7. Care of tools and materials
8. Dependability
9. Initiative
10. Interest
11. Judgment
12. Mastery of principles
13. Neatness and order
14. Originality
15. Posture
16. Punctuality
17. Self-direction
18. Self-reliance
19. Speed or time
20. Workmanship

In developing a rating-scheme for any unit, first determine which qualities actually enter into the unit. For example, in job-press feeding in a printing course, neatness and order, care of tools and material, accuracy, speed, and aptitude would be important factors, while there would be little or no demand for artistic ability or originality, although these would be important factors in other units. This means that each unit of work should have its own set of rating-factors.

Having selected the rating-factors, it is next necessary to evaluate each one. A simple and feasible scheme for establishing the rating is to make the sum of the maximum points for all factors equal 100. The value of the several factors is apportioned according to their relative importance, and the rating of the student or apprentice is then determined by considering how many of the maximum number of points on each quality he actually deserves.

In the specimen score cards shown herewith, Specimen A is the simplest form, listing and evaluating six different qualities. In Specimen B the factors selected are placed in two groups, one representing the objective qualities, to be evaluated from the work of the student, while the other represents the personal qualities, to be judged by observing the student himself. In Specimen C there is an effort to interpret each of the factors, both to guide the instructor making the rating and as an explanation to the student receiving it.

SCORE CARDS FOR RATING STUDENTS FOR SHOP WORK

Specimen A

Speed	20 points
Accuracy	30 points
Neatness and order	15 points
Care of tools and material	15 points
Attitude	10 points
Workmanship	10 points
Total	100 points

Specimen B

I. Objective qualities		
1. Speed	20 points	
2. Accuracy	30 points	
3. Neatness	10 points	
		60 points
II. Personal qualities		
1. Attitude	20 points	
2. Attention	10 points	
3. Application	10 points	
		40 points
Total		100 points

Specimen C

I. *Speed*	20 points
Is the student fast, moderate, or slow in executing his work?	
Is he quick or slow in his manner of moving?	
Does he spend his whole time on his work?	
II. *Attitude*	20 points
Is the student interested in his work?	
Does he waste much time?	
Does he read literature related to his work?	
Does he show an interest in the shop talks or demonstrations?	
Does he keep a notebook for shop notes and sketches related to his work?	
Does he take an interest in keeping the shop and materials neat, clean, and in good condition?	
III. *Accuracy*	20 points
Does the student make many mistakes?	
Is he careful in laying out and working materials?	
Does he make many errors while the job is in progress?	
Does the finished work show many errors?	
Is his work finished up in a neat manner?	
IV. *Mastery of principles*	20 points
Does the student's work indicate that he has mastered the different processes in the lesson?	
Does he make the same mistake over and over?	
V. *Application of principles*	20 points
Is the student able to apply the principles of past projects to new projects?	
Total	100 points

The score-card method has the virtue, over the blanket method arrived at by snap judgment, of breaking up the single judgment with its chance of error into several judgments, each with its possibility of error but with the probability

of these errors offsetting each other; that is, if the rating is too severe on one factor it may be too generous on another, so that the final rating is more likely to be just and fair. This method also discloses weak points, and a wise instructor will direct the student's efforts toward improving these deficiencies when they have been discovered.

The Measuring Scale. Out of our studies in trade analysis and student analysis has recently come the development of the score card into the measuring scale. In this device each factor is analyzed into carefully graded degrees by which it is possible to determine just what stage of proficiency the student has attained in each factor. Each degree is given a value in points, and the sum of all points makes the total rating. For each factor the schedule should give several degrees below the minimum grade to be accepted. This is desirable in order to make a just and careful evaluation and description of the qualities in which a student may prove deficient.

Here is shown an analytical grading schedule developed by the United Typothetæ of America, Department of Education, for rating printer's apprentices in elementary hand composition. A different grading schedule is used for each unit of lessons. In this schedule it will be noted that two of the factors, speed and accuracy, are quantitative and can be rated according to the achievement shown in a performance test — speed, from the number of lines of 10-point type set in one hour, and accuracy, by the number of errors found in the proof of this composition. This kind of rating is absolutely impersonal and subject to no controversy or misunderstanding by either teacher or student. For the other factors the degrees are stated qualitatively and are evaluated by determining in the comparative scale the term best describing the student

GRADING SCHEDULE FOR ELEMENTARY COMPOSITION IN PRINTING

Rating-Factors	F	E	D	C	B	A
Speed Based on composition of straight matter, 10-point, 20 picas wide	4 lines per hour Inert *5 points*	6 lines per hour Slack *6 points*	8 lines per hour Dilatory *7 points*	10 lines per hour Moderate *8 points*	12 lines per hour Rapid *9 points*	14 lines per hour Swift *10 points*
Accuracy Based on average number of proof-mark mistakes per line	5 mistakes per line *13 points*	4 mistakes per line *15 points*	3 mistakes per line *17 points*	2 mistakes per line *20 points*	1 mistake per line *23 points*	No mistakes *25 points*
Neatness and Order Based on care of material, etc.	Slovenly and smeary *10 points*	Negligent *12 points*	Cursory *14 points*	Clean *16 points*	Tidy *18 points*	Immaculate *20 points*
Workmanship Based on justification, spacing, handling types, etc.	Awkward *10 points*	Crude *12 points*	Coarse *14 points*	Fair *16 points*	Dexterous *18 points*	Expert *20 points*
Attitude The student's mental reaction toward his work	Indifferent *6 points*	Perfunctory *8 points*	Passive *9 points*	Interested *10 points*	Eager *11 points*	Enthusiastic *12 points*
Aptitude The native tendency of the individual to acquire skill in this line of work	Stupid *6 points*	Bungling *7 points*	Clumsy *9 points*	Handy *10 points*	Capable *11 points*	Adept *13 points*

or his work, and then by allowing the rating indicated by that term. It will be noted that for the factor of speed there is given a qualitative as well as a quantitative scale, for use in units of work which cannot be as definitely evaluated in quantitative terms.

The sum of the points allowed on all factors will be the grade given. The sum of all the points in the lowest column (F) is 50 and in the highest column (A) 100. If the student falls, in respect to any factor, below the degree specified in column (C), he should be required to repeat the work of the unit until he can measure up to this standard.

It is not always possible to find descriptive words that fit the scale perfectly in a given number of uniform degrees from minimum to maximum; the position of the term in the scale must help in determining the rating. The study of the dictionary to find such terms will prove a valuable exercise for an instructor in developing his ability to analyze his students and to use adequate and correct terminology in describing them.

This kind of a schedule when once developed is simple to use. With the rating indicated on the schedule by check marks, any student can see at a glance just where he stands, and can recognize what, in the opinion of his instructor, are his strong or weak characteristics. This schedule is less susceptible to the caprice of the instructor's judgment than even the score card. Such a measuring scale is as easily adapted to any branch of trade work as to the various units of the printing trade. The remarkable success attending the use of this device in a number of schools throughout the country gives promise that herein is a contribution toward one of the hitherto most perplexing problems in connection with shop teaching.

Distribution of Rating. There has been much discussion recently growing out of a recognition of the diversity of

ratings given by different instructors. Some studies and investigations have shown that among teachers there is no uniformity in rating students. The lack of valid standards and the wide variation of judgment found all the way from primary teachers to university professors in evaluating their students is little short of scandalous. Some teachers are too generous in their ratings, others too severe. When the majority of a class is rated above 90 per cent it means either that the class as a whole is of exceptional ability or that the instructor is too liberal in his marks. The reverse would be true when the average marks of a class were unusually low. We have seen that the distribution of human ability follows the normal bell-shaped probability curve. It is also probable that the distribution of ability within any group of individuals will also follow this curve. There will always be a few exceptionally able and a few of lesser ability, but the majority will represent medium ability. Occasionally a class will have more members superior than inferior, but just as frequently will the teacher encounter a class in which the reverse condition is found, so that for a considerable number of classes these extremes balance and the normal probability curve prevails. If this is true of the normal distribution of ability, it should also be true for the ratings given to a series of classes, provided the ratings express an accurate record of the ability of the students. Studies made in the matter show that for a percentage scale of rating, with 70 per cent as the passing mark, a consistent distribution of grades will average about as follows:

7 per cent of the class will receive grades below 70 per cent
24 per cent will receive grades between 70 per cent and 77 per cent
38 per cent will receive grades between 77 per cent and 84 per cent
24 per cent will receive grades between 84 per cent and 93 per cent
7 per cent will receive grades above 93 per cent

This distribution is shown graphically in Fig. 12. As we have said before, the ratings for any one class may not fall exactly within this distribution; but for a number of classes, the average should approach this schedule. This, then, is a means for each instructor to check up his own grades to determine whether he is, on the whole, too generous or too severe. For any class in which the ratings, as first proposed, do not follow this distribution, let a careful reconsideration be made to determine whether the methods and standards are

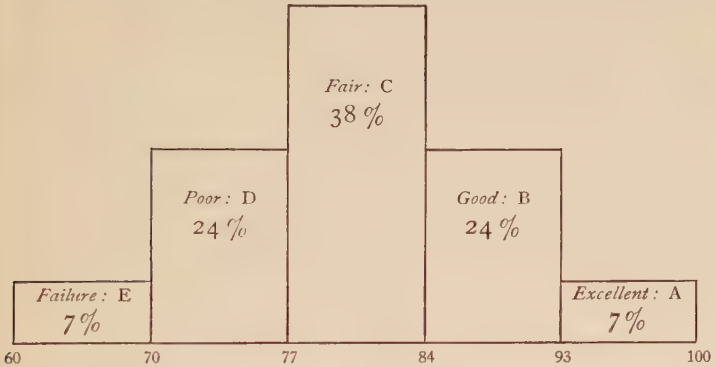

FIG. 12. A normal distribution of pupils' ratings throughout any class or school. (From Starch, Educational Psychology (1921), p. 442)

sound and whether the average ability of the class really coincides with the tendency of the grades away from the normal toward either extreme. With a class of exceptionally good students the tendency should be toward the maximum end of the scale; with a group of unusually dull students the opposite tendency should appear. This consideration, of course, applies to the rating of the class as a whole, and is rather a checking up of the instructor. To determine which individuals receive the highest, which the lowest, and which the medium rating is another matter.

Rating-Standards. The question is frequently raised as to what extent journeyman standards should be imposed in rating apprentices. Shall the student's proficiency be compared with that of the man of several years' experience at the trade, or with the average achievement of normal individuals of his own age and length of experience? The question is complicated by the fact that in most of the skilled trades for which apprentices are being educated, the standards are so indefinite or variable. Such standards as have been set up by labor unions are based more upon economic and social considerations than upon human capacity for performance. In a few trades some quantitative standards are recognized, as in operating typesetting machines. For the majority of trades, however, the qualitative elements far outnumber the quantitative ones, and the variables are far more numerous than the constants.

In general it will be recognized that for quantitative work requiring much practice to attain maximum or normal proficiency, the beginner should not be judged by journeyman standards. It would be unreasonable to expect the carpenter's apprentice of one month's experience to lay as many shingles in a day as the journeyman. For the qualitative factors, however, the student or apprentice should not be given a job that he cannot, by reason of his previous experience and the instruction in connection with the work, perform according to journeyman standards. Trade skill is really the sum of numerous small skills, most of which are within the ability of the apprentice to perform according to standards suitable to the situation. Wherever possible the performance tests given to determine proficiency should be in terms of journeyman performance and standards. Where this is not possible the standards should be those that the average apprentice

of the same experience could meet. This is another reason why each unit of work must have its own grading standards. A single score card or measuring scale cannot be applied to the trade as a whole. This discussion may be summed up thus:

1. Identify the fundamental skills or characteristics to be used as rating-factors.

2. Adopt the *normal* achievement in these factors by individuals of given classes or groups, based upon maturity, previous experience or training, etc., as the standard by which to measure and rate the progress of students at any given point.

QUESTIONS

1. What are your reasons for grading students?

2. What are the objections to the "snap judgment" method of rating? to the "blanket" method?

3. What are the advantages of the measuring-scale method in determining ratings?

4. Should students be informed of the basis upon which they are rated? Why?

5. What is the relative importance of personality factors, knowledge factors, and performance factors in rating students?

6. To what extent should an apprentice be rated by journeyman standards?

7. In what respects would the rating differ in determining for a given skill the proficiency of a stranger (for example, an applicant for a job), and a student who has learned the skill under the direction of the instructor making the rating?

8. Of what significance are the dispositions, aptitudes, habits, etc. that determine success in life in rating apprentices?

9. List the factors upon which you would rate apprentices in your trade. Determine which may be evaluated qualitatively and which quantitatively.

10. For each of these factors develop a graduated scale of five or six degrees and supply suitable descriptive terms for each degree. For the quantitative factors give the numerical data for the various degrees.

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VII. SHOP DISCIPLINE

The end of all school activity is to secure proper behavior and performance on the part of pupils, both during their school career and throughout life. This proposition is as true in shop work as in academic work. Relative to the difficulties encountered in connection with conduct of pupils in school, a second proposition, of even more significance to the teacher of shop work, is that *good discipline depends upon good management.* In psychological terms, the teacher presents the stimuli which produce the proper reactions ; or, he creates or controls the situations which bring the desired responses.

The three factors involved in each of these propositions — the student, the school conditions, and the teacher himself — indicate the threefold phase of the teacher's responsibility. Since the student is the end for which the school exists, it is essential that the school organization and methods should be built up with reference to his nature and capacity, and the teacher should therefore first of all have a sympathetic understanding of his students.

In our pyschological analysis of students we have seen (1) that each individual possesses certain fundamental instincts or tendencies which are the foundations upon which rest the motives for nearly all human conduct; (2) that each individual is provided with the outfit of sense organs through which are poured the percepts from the outer world which are interpreted into meaning by his native mental capacities of association of ideas, reason, judgment, etc.; (3) that there are poured into the complex of his personality both hereditary tendencies from his ancestors and habitual responses to the situations that have been presented to him throughout his own lifetime; (4) that his behavior is controlled or influenced by the powers of memory, habit, reflexes, and judgment.

For the teacher of shop work the great period of adolescence is especially significant, for he is dealing with individuals who are ceasing to be boys and who are becoming men. But they are in the turbulent period of transition when habitual and unquestioned conformity to law during the non-moral period of childhood is breaking down, and the individual is looking toward the period when his habits and conduct shall have their source in his own reason, judgment, and will. This is the stage when the boy is neither a child nor a man. In spite of all his restlessness and annoyance to others, his chances are excellent of becoming a good man when he gets over being a boy. He instinctively resents being treated as a child, for he is rapidly putting away childish things. He demands the treatment due to the man, which is an appeal to reason and judgment rather than a resort to authority. But disciplinary difficulties arise out of the fact that this boy has not yet become a man. He may expect the treatment of a man, but he has not yet learned to give a man's response to this treatment. He is not to be blamed

too harshly for his responses at this stage, for he cannot altogether control them. If mature teachers cannot understand him, how can he be expected to understand himself? His conduct is the result of a newly developed flood of stimuli resulting from the momentous physical and consequent spiritual changes going on within him. His beard is beginning to grow, his voice is changing, his bones and muscles are making the supreme spurt in growth and development. All these events may occur within a single summer, following a longer anticipatory period, and be succeeded by a still longer period of readjustment. Mentally he is taking new measures of men and things and is formulating his own meaning and interpretation of life. The man or woman who cannot appreciate the significance of adolescence is out of place in teaching boys or girls between twelve and eighteen years old. Let us then lay down as the fundamental principle of discipline in dealing with adolescents that the teacher must have a sympathetic attitude toward boys and girls at this stage, and treat them no longer as children, but as coming men and women.

PUPIL OFFENSES

From this point of view let us examine some of the common offenses of pupils of this age with special reference to conduct in the school shop.

1. **Talking.** Pupils talk because there is somebody to talk with, and their conversation is about the things that interest them most. The offense is often spontaneous, but they also indulge in it because, in their outgrowing of the period of authority, they wish to test out the teacher and match their own developing will or cleverness against his. Obviously the remedy lies either in getting the pupil so interested in his work that he will not desire to talk or in isolating him so that

there is no opportunity to talk. This most natural propensity must be controlled, not forbidden.

2. **Sneaking.** Pupils conceal errors, hide spoiled work or broken tools, or evade restrictions. Quite naturally they wish to avoid the instructor's disapproval of their error. Whenever the teacher discovers such a case he should seek to impress upon the pupil the importance of honesty and frankness as the best policy in life. Also point out the reasonableness and necessity of any restriction in order to obtain a common good, and emphasize the meanness of any individual in evading it.

3. **Sulking.** This is a reaction of the pupil resulting either from his propensity to resist authority or from being thwarted in some action that promised satisfaction to him in some way. It is a difficult situation to deal with. The will of the teacher when reasonable must always be supreme, and the student must be led to realize this fact as well as the folly of his own conduct. Patience, tact, and firmness are required on the part of the instructor.

4. **Inattention to Work.** This may be because the student's interest is elsewhere. The job may be too difficult for him, or it may be distasteful because it lacks the element of satisfaction, or he cannot appreciate the reward that will accrue to him as a result of his effort. The treatment in any case should be adjusted to the cause and will usually be easy to apply when the cause is determined. Remove the conflicting interest, if possible, develop some rival interest, or adjust the work to the student's ability. Discover the instincts that are thwarted, or find the dominating motive.

5. **Meddling.** This is sometimes a result of sheer curiosity not properly restrained. It may also result from the fact that the boy has nothing else to do. Cases are frequent where students give attention to the activities of their fellows because

their instinct of domination is unusually strong. These persons are the bosses, foremen, and managers of the future. If they evince a capacity for leadership or responsibility, by all means provide some satisfaction for this tendency. Give them special duties in connection with the management of the class; make them your helpers.

6. **Rebelling against Undesirable Work.** This is sometimes a symptom of the developing self-will of the boy. It is also occasionally fostered by snobbish parents who think their own child too good for some of the inevitable tasks of life. In every well-regulated and well-managed school shop the work of cleaning up should be equitably distributed among pupils, not to relieve the instructor or janitor of any duties but to teach wholesome lessons of neatness, order, and coöperation. Rotation of the work among students according to a fixed schedule will remove any suspicion of impartiality on the part of the instructor and will eliminate any menial aspects. The pupil who rebels against doing his legitimate share of this work is a social offender, and his treatment may oftentimes be intrusted to the class as a whole. The student who attempts to evade the disagreeable features of his job, such as distributing pi, cleaning machines, snagging castings, etc., should be shown that life contains many unpleasant but unavoidable tasks. A kind appeal to reason usually prevails. Sometimes a tedious job is facilitated by words of encouragement or by "jollying," by rivalry, or by other devices which elicit the coöperation of the play instinct. Never encourage or permit any student to think that he is above any task connected with the school shop work. Such an idea is undemocratic and un-American. Our schools must not tolerate aristocracy or snobbishness. No pupil is too good to do honorable work. Assigning disagreeable work as a means of punishment is a

questionable practice, since it recognizes the fact that some work is undesirable, contrary to the social ideal that all necessary work is honorable.

7. **Tardiness.** Students who are habitually tardy usually reflect a poorly disciplined home. Seek to overcome this detrimental habit by extolling the virtue of punctuality. Sometimes coöperation with parents will have good effect. If punishment is necessary, let it be adapted to the cause, using such means as detention after school, discount in rating, or deprivation of privileges. There is no common offense that gives teachers more irritation and concern than tardiness. The cases of chronic or incurable tardiness are, however, usually limited to a small percentage of the class. Besides the determination of the instructor to discourage tardiness, his own example of punctuality is an important factor in dealing with the situation.

8. **Truancy.** Closely related to tardiness is the offense of truancy. It is accounted for almost entirely by the principle of interest. The boy stays away from school because the school is not his dominating interest; either some other attraction makes a stronger appeal or the school is distasteful or repulsive. Perhaps he has had trouble with his teacher; or his adolescent restlessness may take the sudden but frequent form of "Wanderlust." The school ought to be the most interesting place in the world for him, and his teachers should be regarded as his best friends. As in the case of all other offenses, find the real cause of the truancy before prescribing treatment. It may be that this cause lies with you rather than with the boy.

9. **Untidiness.** The home training is always revealed in the personal appearance of the student, and too much blame should not be put on his shoulders. If the home has failed to teach the virtues of neatness and cleanliness, the teacher must

make a trial at it. The school is responsible for fostering the habits of personal tidiness. Emphasize the importance of tidiness both hygienically and socially. The instinct of approbation is one basis of this effort. Personal shame may be the appeal. If this fails, send the offender to the lavatory to wash unclean hands and face or to comb disheveled hair. Communication with parents may be advisable. Never humiliate a student by referring to shabby clothes if they are the best his family can afford. This is a different matter from untidiness.

Some day that slovenly boy will surprise you by coming to school attired in his best clothes, with starched collar, combed hair, clean face and hands, and generally immaculate appearance. There is a reason, a delicate and tender one, based upon the sex instinct, as every teacher who knows adolescent youth will understand.

10. **Impudence.** Disrespectful remarks or replies always reflect the attitude of the student toward the teacher and reveal the degree to which the latter has failed to win the boy's respect. It is oftentimes invited by the teacher who fails to maintain the dignity and respect for pupils which should characterize him. Pupils will be more impudent to some teachers than to others. Sometimes remarks are misinterpreted by the teacher; that is, the boy does not intend any disrespect and fails to comprehend the import of his words. Again, impudence is due to lax home training and reflects the attitude and language that the boy has acquired in his out-of-school environment. In dealing with this exasperating offense (which should never be overlooked) the teacher must first of all keep his own temper. Get the boy to realize the seriousness of his remark and encourage him to apologize. This is a delicate personal matter, and the aid of a third person is often effective in getting the boy into a penitent attitude. It

is always well if he can be persuaded to return voluntarily and apologize to the teacher. Let this be done privately, not in the presence of other pupils. An apology should always be accepted from a boy, no matter how stumbling or faltering may be his speech. The right attitude is the thing desired, not the words. Meet a boy more than half way, always, when he appears to take the initiative to square up an affair.

DISCIPLINARY HYGIENE

The foregoing discussion of student offenses is the negative phase of the discipline problem. A good teacher is one in whose classes "cases" of discipline seldom occur; one who creates an atmosphere of delight and satisfaction; one who understands the inherent nature of his students and promotes their best welfare by inhibiting or preventing undesirable conduct through furnishing stimuli which naturally produce the desired responses. Good discipline is not repression of activity. The teacher who is always issuing prohibitions and spending considerable time in frantic efforts to enforce them is by no means a master of discipline; his is a negative attitude when it should be positive. The world has outgrown the "thou shalt not" stage, and has entered upon the stage where human behavior should be prompted by the "thou shalt love" principle. To love one's neighbor as oneself requires first of all an understanding of that neighbor; a knowledge of the motives prevailing in his behavior, a knowledge of what appeals should be presented and what avoided.

This is based upon the psychologic law of effect; namely, that a response is strengthened by resulting satisfaction but weakened by resulting annoyance. Good discipline, therefore, is secured by stimulating responses from which students will derive satisfaction rather than annoyance. Satisfaction as

used in this sense does not mean indulgence in passing whims or notions that will later produce irritation ; it means that the teacher should prompt activities that the student will recognize as contributing to his highest ultimate good as well as giving immediate pleasure.

Just as the practice of medicine has evolved from the original purpose of treating the patient after he became sick to the phase of preventing disease, with the still nobler function now developing of aiding each individual by right living to achieve his maximum of physical efficiency and well-being, so the question of discipline in school no longer should mean punishment of student offenses, nor even the mere prevention of wrongdoing ; but it should involve the whole regulation of the student's behavior to the end of developing him into a self-controlled individual whose conduct not only will not give offense to his fellows but will give to him a reaction of utmost satisfaction and enjoyment in life. How momentous, therefore, is the responsibility of the instructor who controls the environment whence the student receives the stimuli for the greater part of his actions during school hours !

DISCIPLINARY "DON'TS" FOR THE TEACHER

Don't bluff. You cannot fool all boys and girls much of the time, nor very many of them any of the time.

Don't nag or scold. This kind of stimulus does not produce the most satisfactory response.

Don't use sarcasm. This wounds the sensitive feelings of pupils and alienates their good will instead of winning their confidence. The teacher, of all persons, should exercise at all times the most self-restrained dignity.

Don't forget that your students have memories. Just recall your own school days : remember how the harsh treatment

which you received from some teacher left a sting which you will never forget. Discipline that leaves resentment has failed of its purpose.

Don't make a long list of rules or prohibitions. Let every regulation that you impose be self-evident in its necessity and purpose in securing an advantage for the class. In other words, make regulations only when the need for them is obvious.

Don't threaten. Nothing reveals a teacher's lack of resource more than frequent threats which cannot be carried out. An attitude of reserve power should be maintained by refraining from uttering judgments until a situation has been thoroughly analyzed. When the proper moment arrives for issuing a decision, let it be positive and irrevocable, based upon impartial justice.

Don't magnify little things. Many actions of boys and girls are prompted by instinctive impulses which they will naturally outgrow. It is a mark of good judgment to know what to overlook in pupils' conduct as well as to note the actions demanding attention.

Don't humiliate students by imposing degrading tasks to be performed in the presence of the class or with the knowledge of the class. This incites rebellious sentiments in the pupil; also it oftentimes makes him a hero before his fellows.

Don't depend upon other teachers or your superiors to settle your disciplinary troubles for you. A good teacher takes care of his own discipline just as far as possible. He refers cases to his superior only after he has exhausted every means in settling them himself.

Don't forget that at least 50 per cent of the source of all disciplinary trouble lies with the teacher rather than with the pupils.

Don't forget that the best disciplinarian is the one with whom questions of discipline seldom occur.

Don't review the pupil's past errors or difficulties. Let him live them down; let the dead past remain dead.

Don't forget that the troublesome boy will probably become a good man when he gets over being a boy. He may even be a member of your board of education ten years hence.

"DON'TS" FOR SUPERVISORS, DIRECTORS, OR PRINCIPALS

Don't interfere in cases of discipline until they are formally referred to you.

Don't break down the teacher's influence by disagreeing with him or reprimanding him in the presence of pupils. Difference of opinion should be expressed privately.

Don't fail to give proper attention and secure definite settlement of cases that are referred to you.

Don't be in haste to communicate with parents relative to trouble. A reputation for settling things yourself will be one of your most valuable assets.

Don't allow an exception in your attitude of unyielding firmness based upon fairness and sympathy for all parties concerned.

QUESTIONS AND PROBLEMS

1. State what the teacher should do in the case of a pupil who, when asked to pick up a piece of paper from the floor, replies, "I did not put it there."

2. What should be done with the boy who acts sleepy or "dopey" during the class?

3. What is the value of securing written apologies?

4. Under what conditions may a public apology be required of a student?

5. Would you keep a written record of student offenses? Why?

6. What is the value of suggestion and imitation as disciplinary agents?

7. Discuss the value of each of the following as aids in discipline:

a. Visible control of the class.

b. Physical details of the shop, such as light, ventilation, arrangement of equipment, washing-facilities, etc.

c. Organization of instruction details, such as analysis charts, progress charts, job orders, instruction sheets, etc.

d. Devices for promoting school morale, such as a written pledge from students, a school or class slogan or motto, organized student government.

e. Student assistants as foremen, monitors, tool and stock keepers, timekeepers, etc.

8. List the common causes of disciplinary troubles according to your observation.

9. How does the use of report cards influence discipline?

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INDEX

Activity, propensity for, 199
Adolescence, 223, 224
Aiding the senses, 189
Analysis, trade, ix, 25; of a job, 34; of auxiliary content, 36; of students, 155–233
Application, a lesson step, 86, 93, 94, 100
Approbation, desire for, 207
Attention-getting, instinct of, 207
Auxiliary content of a job, 35

Blocks, trade, 29

Calculations, trade, 37
Card index for job orders, 148, 150
Cardinal qualities of a teacher, 128–132
Care of shop, 107–109
Chart, trade-analysis, 40, 41; teacher's self-estimate, 125–128; student's progress, 150–153; project-progress, 153, 154
Class management, 103–118; observation of, 19
Class routine, organization of, 107
Classification of equipment, 141
Classroom conditions, observation of, 16
Compensation, instinct of, 204; teacher's, 132
Competition, instinct of, 208
Condition of shops, schedule for rating, 110–113
Confidence, self-, 203
Control, instinct of, 208, 209
Coöperation of the senses, 185
Coöperative schools, 8
Cost of equipment, 142, 144
Creative instinct, 202
Credentials, students', 205
Credit certificate, 205

Defects in sense perception, 187
Desire for approbation, 207
Difficulty, learning, 31; production, 31
Disciplinary hygiene, 229
Discipline, shop, 222–224
Discrimination, 186
Distribution of intelligence, 161, 162; of ratings, 217–219
Domination, instinct of, 208, 209
"Don'ts" for the teacher, 230; for supervisors, directors, and principals, 232
Douglas Report, Massachusetts, 1906, 3
Drawing, trade, 38

"Educational Psychology," Thorndike, 164, 177, 178; Starch, 219
Effect, law of, 48, 194
Efficiency in learning, 52
Elementary schools, 2
Equipment, observation of, 13; organization of, 106, 145; classification of, 141; cost of, 142, 144; arrangement of, 142, 145; ordering, 143; specifications for, 143; inventory of, 144, 146
Ethics of the teaching profession, 118–134
Examination, the, 75–78
Exercise, law of, 47, 192, 193
Experiment, the, 70–73

Fatigue, 200
Federal Board for Vocational Education, bulletins of, iv, 7, 9, 35
File, reservoir, 148
Floor plan of shop, 140

Generalization, 95, 100
Grading schedule for printing, 215, 216

Habit, laws of, 191–195
Hearing, sense of, 182
Hereditary traits, 177
High schools, 2
" How to Teach," Strayer and Norsworthy, 51, 52, 194
Human motives and interest, 198–209
Hygiene, disciplinary, 229

Illustration, the, 69, 70
Impudence, 228
Inattention to work, 225
Industrial arts, definition of, 7
Industrial education movement, 3; rapid growth of, 4; difficulties in introduction of, 8
Industrial schools, 4
Instincts, 168–173
Instruction devices, 57–79
Intelligence, distribution of, 161, 162
Intelligence quotient, 161
Intelligence tests, 175, 176
Intensity, principle of, 193
Interest, 198–209
Invariability, principle of, 192, 193
Inventory of equipment, 144, 146

Job-analysis chart, 148
Job elements, 29
Job orders, form for, 148; card index for, 148, 149
Job, production content of, 34, 35; analysis of, 35; auxiliary content of, 35; technical content of, 35
Judgment, trade, 39, 195, 196
Junior high school, 8

Knowledge of stock, 35

Law, of readiness, 46, 47; of exercise, 47, 192, 193; of effect, 48, 194
Laws of learning, 45, 46
Learning, method of, 44; laws of, 45, 46; progress in, 48, 49; efficiency in, 52
Learning a trade, methods of, iii, 1; meaning of, 194
Learning-difficulty, 31, 34
Lecture, the, 61–64
Lesson, a teaching-unit, 79–88; characteristics of, 80; kinds of, 81; stages of, 82
Lesson-planning, 96–102; observation of, 21

Management, class, 103–118; shop, 138–154
Manipulation, instinct of, 201
Manual training, iii, 2, 7
Materials, observation of, 14; classifying and ordering, 144
" Measure your Mind," Trabue and Stockbridge, 174, 175
Measuring scale, 215
Meddling, 225
Mental ability, 175
Mental capacity, 174
Motives, human, 198–209
Muscular sensation, 182

Native ability, 175, 176
Native capacity, 167–178
Neurones, 163
Night schools, 8
Normality, principle of, 158

Observation of teaching, 10–24
Offenses of pupils, 224
Operating the school shop, 147
Oral recitation, 58–60
Organization and management of shop, 138–154
Organization of subject matter, 17, 22, 54, 103; of equipment and supplies, 106; of class routine, 107; of records and forms, 114

Part-time schools, 7
Plan-book, daily, 154
Planning a lesson, 96–102
Plateaus of learning, 51, 194
Practice on the job, 73–75
Practice teaching, 135–137
Preparation, a lesson step, 84, 88–91, 98–100
Presentation, a lesson step, 85, 91–93, 100
Prevocational schools, 8
Pride in good workmanship, 204
Principle, of uniformity, 158; of variation, 159; of fatigue, 200

Principles of teaching, 42–134
Printing, grading schedule for, 215, 216
Process, the teaching, 42; the learning, 44, 45
Product, students', 15
Production content of a job, 35
Production factors, 34
Production in the school shop, 147
Production-difficulty, 31
Professional status of the teacher, 118–120
Progress chart, student's, 150–153; project, 153, 154
Progress in learning, 48, 49
Progression factors, 31; table of, 32–33
Promotion of students, 18
Propensity for activity, 199
Psychological terms, 165
Pupil offenses, 224

Qualities of a teacher, 128–132
Questioning, 64–69
Questions, kinds of, 77

Rating, distribution of, 217–219
Rating condition of shops, 110–113
Rating students, 210–221; observation of, 18
Rating teachers, 122–128
Rating-factors, 212
Rating-schemes, 210
Rating-standards 220
Readiness, law of, 46, 47
Rebelling against undesirable work, 226
Recitation, oral, 58–60; written, 60, 61
Recognition of stock, 36
Records and forms, organization of, 114
Repetition, principle of, 192
Reservoir file, 148–150
Rivalry, instinct of, 208

Safety precautions, 36
Satisfaction, principle of, 193
School organization, place of teacher in, 120–122
School shop, operating, 147; standards for, 139
Science, trade, 38
Score card, for rating teachers, 123, 124; for rating students, 212
Self-confidence, 203
Self-estimate chart, teacher's, 125–128
Sensation, muscular, 182
Sense, of touch, 181; of hearing, 182; muscular, 182; of sight, 182; of smell, 184; of taste, 185
Sense perception, 36; applied to shopwork, 180–191; defects in, 187
Senses, coöperation of, 185; aiding the, 189
Shop discipline, 222–233
Shop organization and management, 138–154
Shop work, teaching a lesson in, 88
Sight, sense of, 182
Smell, sense of, 184
Sneaking, 225
Specification for equipment, 143
Spiral method, 55
Standards for a school shop, 139
Starch, "Educational Psychology," 219
Stimulus, 163
Stock, knowledge of, 35; recognition of, 36; working properties of, 36
Strayer and Norsworthy, "How to Teach," 51, 52, 194
Student's progress chart, 150–153
Student's work and product, observation of, 15
Subject matter, organization of, 17, 22, 54, 103
Sulking, 225
Supplies, observation of, 14; organization of, 106, 145; ordering, 144, 145
System and organization, observation of, 17

Talking, 224
Tardiness, 227
Taste, sense of, 185
Teacher, the trained and untrained, 26

Teacher, professional status of, 118–120; place in the school organization, 120–122; rating of 122–128; cardinal qualities of, 128–132; compensation of, 132
Teacher's self-estimate chart, 125–128
Teaching, observation of, 10–24; principles of, 42–134; process, 42–57; definition of, 43; factors of, 43
"Teaching Apprentices in the Printing Trades," 35
Teaching-devices, 57
Teaching a lesson in shopwork, 88–96
Teaching a trade, 187
Teaching-methods, observation of, 20
Teaching-profession, ethics of, 118–134
Technical colleges, 2
Testing, a lesson step, 87, 94, 95, 100
Testing students, observation of, 18
Thorndike, "Educational Psychology," 164, 177, 178
Touch, sense of, 181, 182
Trabue and Stockbridge, "Measure your Mind," 174, 175
Trade, methods of learning, iii, 2
Trade analysis, 25; importance of, 26; plan of, 40
Trade blocks, 29
Trade calculations, 37
Trade drawing, 38
Trade habits, 191–195
Trade judgment, 39, 195–197
Trade schools, definition of, 9
Trade science, 38
Trade-teaching, 96–102
Trade terms, 36
Truancy, 227
Type jobs, classification of, 29; arrangement of, 31

Undesirable work, rebelling against, 226
Uniformity, principle of, 158–164
Unit method, 55
United Typothetæ of America, 35, 215, 216
Untidiness, 227

Value of psychology to the shop teacher, 156–166
Variation, principle of, 158–164
Verification, a lesson step, 87, 94, 95
Vestibule school, 8
Visiting schools, 10–24
Vocational Education, Federal Board for, iv; National Society for, iv; principles of, 1; history of, 2; kinds of, 2; definition of, 2, 7; arguments for, 6

"Why Should I Teach?" 133
Working properties of stock, 36